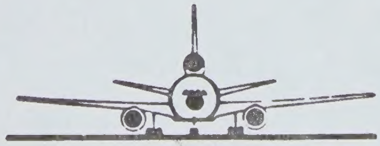
GENERAL AVIATION RELIEVER AIRPORT

SITE FEASIBILITY STUDY

CITY OF FREMONT
CITY OF SAN JOSE

OCTOBER 1982



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FINAL REPORT

GENERAL AVIATION

RELIEVER AIRPORT

SITE FEASIBILITY STUDY

Prepared for

The City of Fremont
The City of San Jose

October 1982

WADELL ENGINEERING CORPORATION
Airport Planning - Engineering - Management Consultants
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SUMMARY

In mid 1980 the Cities of San Jose and Fremont jointly sponsored a general aviation reliever site feasibility study in order to assess new airport demand, identify suitable sites, and provide for a generalized plan for airport development through the year 2000. The study area includes the northerly portion of the South Bay area, extending as far west as Moffett Field Naval Air Station, and as far east as the City of Fremont and parts of Santa Clara County. Existing airports considered within the study include the civil aviation joint use of Moffett Field Naval Air Station, as well as further development of the existing privately owned Fremont Airport.

To determine the physical facilities necessary to meet aviation demand by the year 2000, the starting point is a forecast of aviation demand within the study area. From statistics prepared by the Federal Aviation Administration and the Metropolitan Transportation Commission, there will be a strong trend in general aviation growth throughout the Bay Area. As a result of evaluating and interpreting data from the MTC computer model, it was found that demand for general aviation activity at Moffett Field and in the existing Fremont Airport vicinity could be as high as 550 and 565 based aircraft respectively by the year 2000. The based aircraft as well as transient visitors would result in over 400,000 annual aircraft landings and take-offs at each airport.

Next an analysis was performed to determine capacity and facility requirements to meet projected demand. Due to the availability of adequate business jet airport facilities at the San Jose Airport and Hayward Air Terminal, it was found that new airport facilities need only accommodate single and light twin engine propeller driven general aviation aircraft. Runway lengths in the range of 3,000 to 3,500 feet would be adequate, while two number runways is desirable based upon peak period movements and orientation relative to wind and surrounding land use. Although useful, instrument approach facilities are not mandatory due to availability of navigational aids and good approaches at Hayward Air Terminal and San Jose Airport. A new airport in the Fremont vicinity would require as much as 80 acres of terminal area facilities to provide aircraft parking and space for aviation related businesses.

Based on the identified facility requirements, a site selection study was performed with consideration of four major factors: operations, environmental impact, engineering and cost. The existing Fremont Airport was evaluated as well as several other sites to the northwest and southeast. Of six final site areas compared, the best alternative for general aviation airport development is expansion of the existing Fremont Airport.

After holding public meetings in the Fremont, Milpitas, and Sunnyvale areas the study sponsors chose to focus further general aviation reliever airport planning on the existing Fremont Airport site, with additional

study, discussion, and identification of alternatives regarding local agency agreement with the United States Navy for some degree of joint use at Moffett Field Naval Air Station.

The preparation of more detailed drawings on the existing Fremont Airport site resulted in an intersecting runway system with a 3,000 foot long basic utility stage 2 runway on the same alignment as the existing runway, as well as a short 2,400 foot basic utility stage 1 intersecting runway. The runways were oriented to minimize overflight of residential areas as well as provide suitable clearance for PG&E transmission lines to the northeast. The runways are served by parallel taxiway systems connecting with aircraft parking areas on both sides of the airfield. All buildings are to be developed on the freeway side of the site.

The airport would be developed in stages. The first stage of development from 1982 through 1985 involves land acquisition and construction of runways and terminal area facilities. The second stage of development, from 1985 through 1990, as well as the third stage, from 1990 through year 2000, involves expansion of aircraft parking areas and additional terminal area building development to meet growing demand. In current dollars, the total 20 year development program would cost over $16 million of which approximately $12 million would be requested from the Federal Aviation Administration and State of California aviation user trust funds. The first stage of development including land acquisition and construction would be almost $12 million, with remaining development spread over future years as parking demand requires additional facilities.

An annual cash flow model was prepared identifying anticipated sources of income and expense as well as new capital required for matching State and FAA development grants. Assuming the airport would open in 1985 the annual cash flow would be negative through 1987 after which there would be strong positive cash flow through the year 2000. On an accumulated basis, cash flow would be negative through 1993, followed by a strong growth of airport income and reserves accumulating to over $3.5 million by the year 2000.

Steps that would follow after completion of this feasibility study include the preparation of final master plans and environmental reports and applications for State and FAA grants for land acquisition and airport development.

AIRPORT REQUIREMENTS

1. INTRODUCTION

In mid-1980, the City of San Jose acted on a joint powers agreement with the City of Fremont and contracted with Wadell Engineering Corporation to prepare a general aviation reliever airport site feasibility study. The basic intent of the study, which has 90 percent federal funding, was to assess new airport demand, identify suitable airport sites, and then prepare a generalized airport plan for that site through the year 2000. A final master plan and environmental report would be prepared after completion of the feasibility study. Specific objectives of the site feasibility study were:

- o To determine, in concert with regional planning criteria, a set of forecasts and facility requirements for the development of a new general aviation airport within the study area.
- o To evaluate the feasibility of three sites in meeting forecast general aviation demand: Fremont Airport, an existing privately-owned facility; Moffett Field Naval Air Station; and a heretofore undeveloped site to be identified in the study.
- o To describe the various concepts and alternatives which were considered in the course of the study.
- o To provide concise and descriptive planning information so that the impact and logic of the recommendations could be clearly understood by the community and public agencies charged with the approval of this document and the undertaking of future planning studies.

This feasibility study covers the planning period 1980-2000 and includes the following major components:

- o Inventory of area planning efforts and background data.
- o Forecasts of aviation demand, including the number of operations, aircraft types, and aircraft mix.
- o Evaluation of the impact of new site development on adjacent land uses and the community.
- o Determination of facilities and improvements required to satisfy the forecast demand and an estimate of the costs of airport development.
- o Feasibility of Fremont Airport, Moffett Field, or an alternative site for further development, with an assignment of implementation priorities.

- Recommendation of a plan for the ultimate development of the new site according to community goals and increases in aviation demand.

As with any plan, this feasibility study only becomes effective after it has been evaluated, adopted, and steps are taken to implement it. With this in mind, the plan has been designed to accommodate changes in community goals and aviation trends as they develop, imparting flexibility into the planning process without compromising either the plan or its implementation.

Community participation was invited during all planning phases by the Consultant and study sponsors. Agencies contacted during the course of study include representatives of the Cities of San Jose, Fremont, Milipitas, Mountain View, Sunnyvale, Santa Clara County, Alameda County, the Metropolitan Transportation Commission, the Federal Aviation Administration, and the United States Navy. As well, there was consultation at various points in the study with the U.S. Department of the Interior regarding the S.F. Bay National Wildlife Refuge, the U.S. Army Corps of Engineers, P.G.&E., Leslie Salt, and the Southern Pacific Land Company. Many valuable points of view regarding the future of aviation in the study area were generated through these contacts and are reflected in the site feasibility study.

BACKGROUND TO THE STUDY

San Jose Municipal Airport is located at the southern end of San Francisco Bay and serves the San Jose/Santa Clara County metropolitan area. The airport is approximately three miles northwest of the San Jose central business district and less than one mile from both the Nimitz (Highway 17) and Bayshore (U.S. 101) Freeways. The airport is owned by the City of San Jose and operated by the City Airport Department.

San Jose Municipal Airport provides air transportation facilities and services in response to a strong demand generated in the San Jose metropolitan area. In January of 1981, there were ten air carriers providing commercial air transportation services at the airport in addition to four commuter airlines. Almost 600 general aviation aircraft were based at the facility and the airport had approximately 400,000 annual general aviation operations.

In 1980, a master plan prepared for San Jose Municipal Airport indicated considerable increase in the number of passenger enplanements and general aviation demand. There was, however, limited area available for expansion of San Jose's general aviation facilities and a heightened concern for the safety implications of mixing more general aviation aircraft with air carriers. As a result, the San Jose Airport Department sought to encourage the development of a new general aviation facility to accommodate some of the demand which, if not met at other area airports, would accrue to San Jose.

Santa Clara County, also aware of growing aviation demand in the County and the scarcity of available facilities, was at the same time preparing a master plan for its three general aviation facilities: Palo Alto

Airport, Reid-Hillview Airport, and South County Airport. The problem facing the County was that the two facilites in northern Santa Clara County which might absorb some of the demand developing in that area were limited in expansion potential; the South County Airport, while it had opportunities for expansion, was located too far from the San Jose Airport area to provide any significant relief. As well, there appeared to be growing local opposition to expansion of the South County Airport.

Mid-way through the County's study, a decision was made to identify and evaluate other sites which could accommodate aviation demand if the South County facility were not expanded to its full development potential. Thus, two site feasibility studies for new general aviation airports were being conducted at approximately the same time: the San Jose study which was concerned with meeting aviation demand in the northern Santa Clara/southern Alameda counties area; and the Santa Clara County study which was concerned with meeting aviation demand in the central and southern Santa Clara County area. On-going coordination between these two studies was necessary to avoid double counting of demand and to help establish region-wide priorities for general aviation facility development.

For decades, there has been discussion concerning the best location for a new public general aviation facility in the northern Santa Clara/ southern Alameda county area. Much of that discussion has focused on the existing Fremont Airport, a privately-owned facility which hasn't been developed to meet aviation demand and which doesn't carry a reliever role in the regional airport system. Because the Fremont/San Jose area is experiencing rapid industrial and commercial development, it is important to resolve airport siting and development programs in the vicinity of Fremont Airport and thereby release and/or modify land uses and zoning based on an accepted aviation program.

Of equal long term aviation interest has been the potential for joint use of Moffett Field Naval Air Station. While joint use was considered during the San Jose Municipal Airport Master Plan Study of 1980, it met with a strong negative response from the Chief of Naval Operations in Washington, D.C., as well as from the Commanding Officer of Moffett Field. Yet the Naval Air Station, merely by its presence in the South Bay, represents an opportunity for satisfying growing civil aviation demand.

EXISTING STUDY AREA AIRPORTS

Within the study area there are three airports, two under private ownership and one owned and operated by the United States Navy. Moffett Field Naval Air Station is located at the western limit of the study area and is comprised of two paved runways, the longest of which is 9,200 feet. The airport is not open to joint use by the general public although there is use by the National Aeronautics and Space Administration and a flying club of military pilots operating small single engine aircraft based at the airport.

The two private airports are at the eastern perimeter of the study area. Fremont Skysailing Airport is 10 miles north of the San Jose city center

and has approximately 12 based aircraft. The use is primarily gliders and tow planes. The runway is 1,840 feet long and 30 feet wide and has a treated surface. Fremont Airport is located 7 miles north of San Jose and has approximately 90 based aircraft. Although the airport is under private ownership, it is open to the public for a variety of aviation services including fixed base operations, fuel service, and aircraft maintenance. The primary runway is 2,310 feet long and 40 feet wide with an asphaltic concrete surface. A parallel dirt runway 2,200 feet long also exists but is not frequently used. Both privately owned airports are in relatively poor condition but are generally adequate for the limited usage they receive. Neither airport is currently adequate as is for significant local or regional aviation use, and Moffett Field Naval Air Station is not open for public use by civilian aircraft. The FAA's National Airport System Plan (NASP) identifies future development of a public general utility reliever airport in the Fremont area.

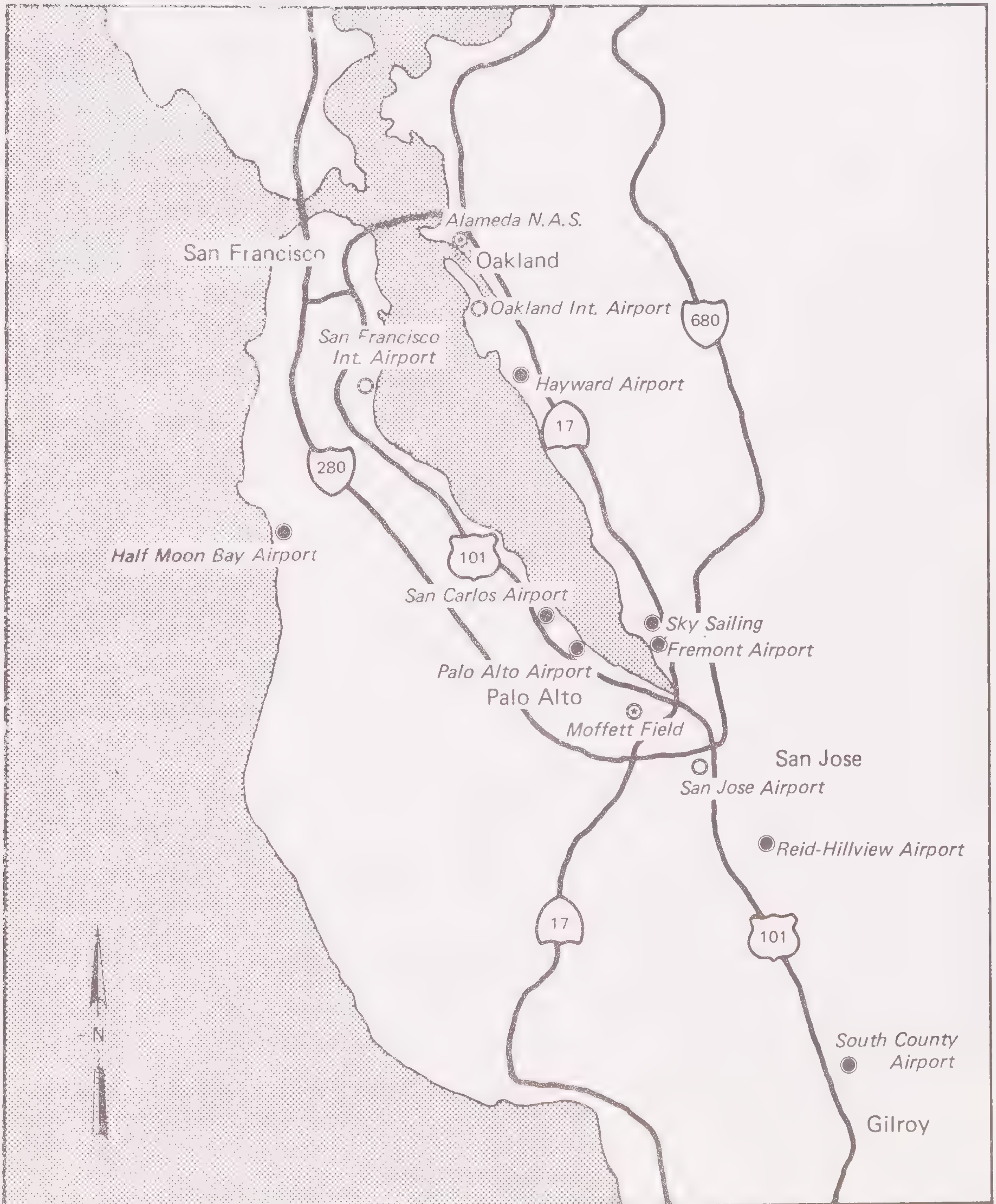


FIGURE 1: REGIONAL SETTING

2. FORECASTS

The activities commonly forecast for airport planning include passengers, aircraft operations, and based aircraft. In this Plan, forecasts are projected through the year 2000.

At the outset of the forecasting process, it is important to recognize the overall impact of general aviation on the nation's economy as well as anticipated growth in general aviation through future years. FAA statistics of current activity as well as forecasts through 1990 identify a strong trend in general aviation growth. Currently there are over 210,000 general aviation aircraft in the United States as compared to 3,600 air carrier and 18,500 military aircraft. It is expected that by 1985 the general aviation fleet will grow to almost 280,000, and by 1990 320,000 aircraft. Total general aviation operations (landings and take-offs) throughout the United States is almost 190,000,000, while some 52,000,000 operations take place at the 460 airports around the country with FAA operated air traffic control towers. Without a doubt, the network of general aviation airports around the United States is the backbone of the Nation's air transportation system.

An airport plan is primarily developed from aviation demand forecasts. The California Department of Transportation (CalTrans) and the FAA through the National Airport System Plan (NASP) have provided some basic information. To receive federal aid, airports must be in the NASP. The FAA's 1980 NASP identifies a New Fremont Airport as a general aviation facility with a general utility role. The number of based aircraft are expected to grow to 141 by the year 1990 and total runway movements to be 119,000.

Regional and system level forecasts are not usually made to a degree of detail suitable for site specific planning purposes, and therefore individual airport forecasts can be best performed during the site planning process. In forecasting, it is the number of based aircraft that "drives" a demand model. Broad factors which influence an aircraft owner's decision to base his aircraft are the location of the airport, the accessibility of the site, and the availability of facilities for the user. Recognizing the character and nature of aviation facilities within northern Santa Clara and southern Alameda Counties, the following developments should result with time:

- o The growth of population in the Bay Area in general and Alameda and Santa Clara Counties in specific will increase aviation demand;
- o The need for general aviation training, aircraft basing, and the saturation of existing airports will result in great demand for new airport development.

Forecasting general aviation activity at a new site in the study area is relatively complex and cannot be separated from other general aviation issues in the South Bay area. Activity at any new site - whether it be through the addition of joint use at Moffett Field or construction of a totally new facility in the Fremont area - is dependent upon development

at other Bay Area airports as well as capacity constraints and limitations. As a result, a primary basis for determining demand for based aircraft and operations is the South Bay Airport Alternatives working paper prepared in October 1980 by the Metropolitan Transportation Commission (MTC). The Association of Bay Area Governments (ABAG) and Metropolitan Transportation Commission (MTC) are responsible for preparing and maintaining a Regional Airport Plan for the nine-county San Francisco Bay Area. This plan was updated in October 1980 and includes policies and recommendations concerning the role of each of the airports in the South Bay. The plan places a high priority on developing a reliever airport capability in the South Bay to enhance air safety at San Jose Municipal Airport as air carrier and general aviation demand increases. The Regional Airport Plan recommended that priorities for providing a reliever airport capability be established as follows:

1. interim use of Moffett Field until Fremont or a training runway ("bounce strip") can be developed in the South Bay

2. development of a new airport in the Fremont area to meet long-range aviation needs

3. construction of a parallel runway at Palo Alto Airport (least preferred alternative)

The plan further recommended that Santa Clara County update the master plans for the county airport system and that Fremont and San Jose conduct a feasibility study or a new general aviation reliever airport in the Fremont area.

Through MTC's established computer models of based aircraft demand, operations, and capacity limitations, it is possible to identify various development patterns and scenarios to accommodate the growing number of aircraft in the already crowded South Bay. This regional approach to evaluating problems and identifying solutions is essential to planning a facility that is not at capacity as soon as construction is completed.

The MTC report was prepared to assist in evaluating different roles for the individual South Bay airports, and to provide a consistent set of demand projections relative to the varying roles.

The following table presents the MTC forecasts of aircraft owners for Alameda, Santa Clara and San Mateo counties. The information was used as a basis for forecasts in this reliever study.

TABLE 1
AIRCRAFT OWNERS BY COUNTY

	1976	1987	1997
Alameda	896	1290	1610
Santa Clara	1494	2260	2740
San Mateo	642	830	1000

Source: MTC Regional Airport Plan, October 1980.

The South Bay Airport Alternatives paper identifies six alternatives which were prepared using MTC's computer model. Major assumptions included MTC's forecast of based aircraft owner location within the region, airport development alternatives and capacity analyses, and various levels of service possible throughout the airport system.

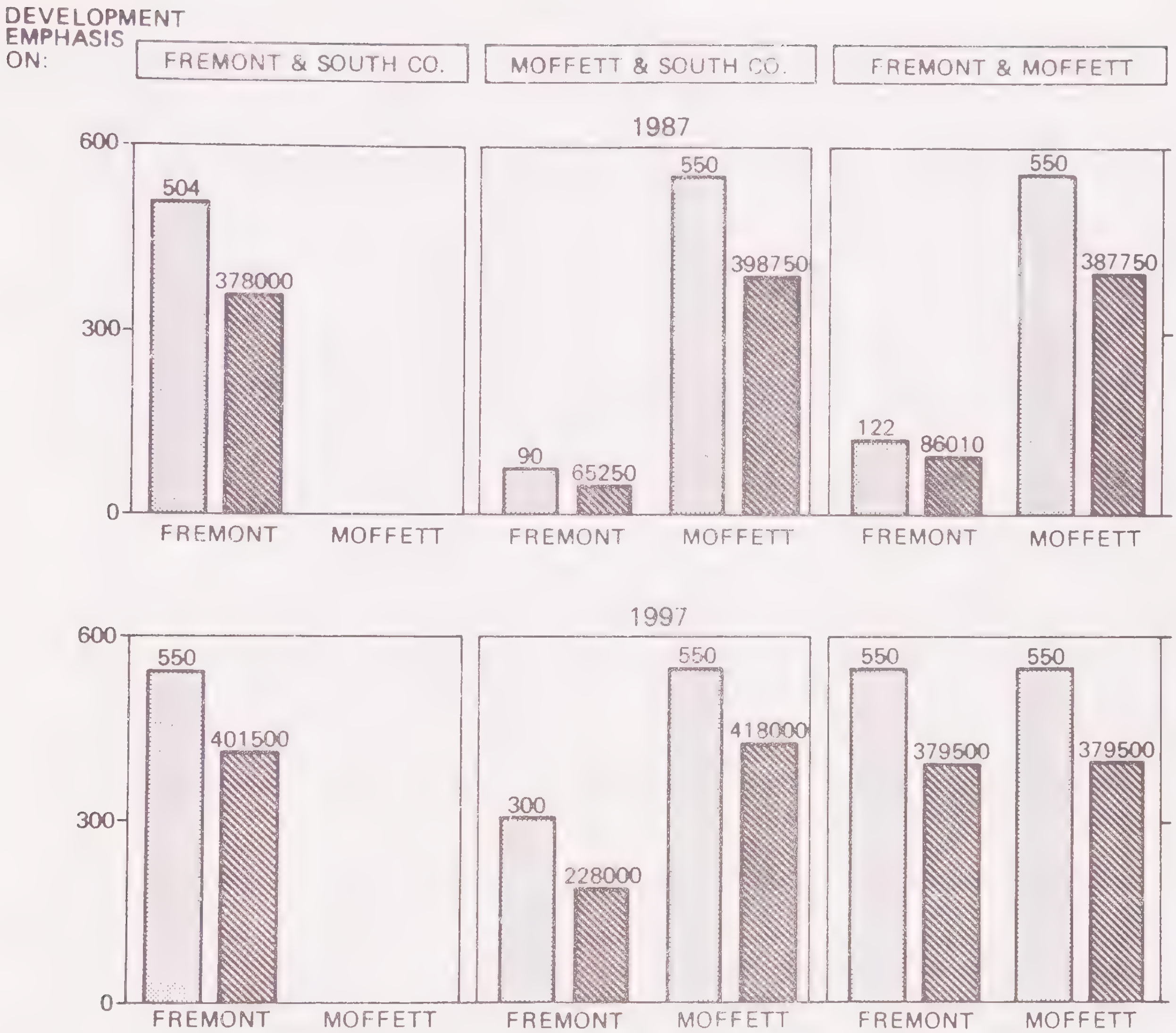
Of the alternatives, particular combinations are important to the general aviation reliever airport study undertaken by the City of San Jose and City of Fremont. These alternatives include development emphasis on Fremont and the South (Santa Clara) County Airport, emphasis on Moffett and the South County Airport, and emphasis on a combined Fremont and Moffett airport development. The figure indicates the number of based aircraft and runway operations in 1987 and 1997, in accordance with the particular system emphasis.

It is clear from the analysis that the unmet 1997 aircraft parking demand is greatest for Santa Clara and San Mateo Counties if the Fremont Airport alone were developed within this study area; both Fremont and Moffett would have to be developed for general aviation use to satisfy 1997 demand.

One alternative of particular interest is MTC's unconstrained airport alternative. In this case, each airport is allowed to handle whatever parking and operational demand may arise without regard to public policy, physical facilities, or capacity of the systems. Under this alternative, in 1997 the Fremont Airport would have 300 based aircraft and 228,000 annual runway movements, whereas Moffett Field Naval Air Station would have 550 based aircraft and 418,000 runway movements. Under the latter case, there would still remain an unmet aircraft parking demand in Santa Clara County of 129 aircraft. This is due to parking constraints at Moffett Field.

For purposes of this site feasibility study, two separate forecasts were prepared for based aircraft and annual operations from 1980 through the year 2000. One of the forecasts assumed airport development in the Fremont area only; the other emphasized joint use of Moffett Field. The forecast provides detailed information useful in determining mix for runway capacity analyses, types of based aircraft for future apron and hangar parking requirements, number of instrument operations for determination of instrument approach capabilities and needs, as well as aircraft operations by type for use in the airport noise analyses.

The forecast for each portion of the study area presents a "worst-case" analysis. That is, in the Fremont case it is assumed that only Fremont and South County Airport would have significant development; under the Moffett alternative, major development emphasis would be on Moffett Field and South County Airport, and the Fremont Airport would remain at its present level of development. Upon development of facilities at either site, a rapid increase in the number of based aircraft can be expected due to the high existing demand. Single engine, multiple engine, and helicopter aircraft are identified in the tables. It is not expected that any business jet aircraft would be based at either Fremont or Moffett since they can be adequately accommodate at the Hayward and San Jose Airports.



UNMET 1997 AIRCRAFT PARKING DEMAND:

	FREMONT & SOUTH CO.	MOFFETT & SOUTH CO.	FREMONT & MOFFETT
SANTA CLARA COUNTY	132	129	–0–
SAN MATEO COUNTY	169	-0-	–0–

LEGEND

BASED AIRCRAFT — ANNUAL AIRCRAFT OPERATIONS

FIGURE 2: MTC SOUTH BAY AIRPORT ALTERNATIVES

The forecast of aircraft operations is by type of operation, type of aircraft, and type of user. The local aircraft movements include touch-and-go training activity as well as flights in the immediate airport environs. The remaining aircraft movements are classified as itinerant, which includes flights that have origins and or destinations away from the area. It was assumed that itinerant operations represent approximately 45 percent of all take-offs and landings.

The instrument operations noted in the table include instrument approaches (when aircraft arrive at the airport under instrument conditions using navigational aids) and instrument departures, which are the primary portion of the instrument operations. Typically there are more instrument departures than instrument approaches at general aviation airports since the instrument approach is a more precise operation and usually occurs when arriving at a destination where it is necessary to let down to the airfield through cloud conditions or fog. Instrument departures most often involve a climb-out from the airport during instrument conditions, often when visual flight rule conditions exist on top of the clouds or for an enroute climb under visual flight rule conditions. While there are no instrument arrivals or departures at Fremont since there are no navigational facilities at the airport, it is important to recognize how much of an instrument operation demand exists. Its satisfaction in the future is subject to the provision of navigational aids, which are themselves dependent on the capability and development of the airports.

Aircraft operations are distributed by type to allow for noise modeling in the Land Use section of this report. Due to the predominant number of single engine aircraft in the general aviation fleet, as well as the fact that most aircraft based at the airport are single engine, the forecast identifies a significant number of this type of movement. Multiple engine operations are a factor of the number of aircraft based at the airport as well as multi-engine aircraft used by transients. Currently, there are only three multi-engine aircraft located at the Fremont Airport, primarily due to the inadequacy of facilities. Upon development of a general utility airport, more multi-engine aircraft could be properly accommodated and therefore the percentage will more accurately reflect area demand. Proportionately, Moffett Field would have more multi-engine aircraft due to the vastness of facilities available. This would most likely reduce the number of multi-engine movements at Palo Alto Airport. The number of helicopter operations is relatively small but is expected to increase over the years as helicopters become based at the public airports.

The forecast also identifies aircraft operations by user type. It is recognized that general aviation flying can be divided into four major categories: business use for executive and/or business transportation; commercial use for activities such as air-taxi, aerial application, and industrial activities; instructional use for supervised flight training; and personal use. The predominant activity at the two airports will be general aviation, since there will be no air carrier service. However, due to the importance of air-taxi activity, a separate category has been identified for the Fremont forecast table. The air-taxi category involves the use of an aircraft by the holder of an air-taxi operating

certificate. Joint use of Moffett NAS would most likely exclude extensive commercial activity, therefore no air taxi use has been identified.

Aircraft operations have been distributed for each facility on the basis of peak month, peak week, average day of the peak month and peak hour. The distribution of aircraft operations is of primary significance on an annual basis for determination of the number of runways and taxiways necessary to meet demands and a peak hour basis for analysis of runway exits, terminal parking apron, and terminal facility space requirements.

It must be realized that the satisfying of demand is subject to the availability of facilities, and that the stage development program will occur gradually over a period of years.

TABLE 2
WADELL ENGINEERING CORPORATION AVIATION FORECAST MODEL
SAN JOSE/FREMONT GENERAL AVIATION RELIEVER AIRPORT STUDY
FREMONT AREA SITE - BASED AIRCRAFT & OPERATIONS FORECAST

	1980	1985	1990	1995	2000
Based Aircraft:					
Single Engine	87	460	474	483	500
Multiple Engine	3	25	39	55	57
Helicopter	0	6	7	8	9
Total	90	490	520	545	565
Annual Aircraft Operations:					
By type of operation					
Local	43,522	205,500	225,500	243,500	252,500
Itinerant	21,728	162,000	177,500	192,500	199,500
Total	65,250	367,500	403,000	436,000	452,000
Instrument Operations	2,316	13,000	14,300	15,500	16,000
Actual Inst. Approaches	579	3,250	3,600	3,900	4,000
By aircraft type					
Single Engine	62,975	344,200	367,350	385,600	399,200
Multiple Engine	2,175	18,800	30,200	44,000	45,600
Helicopter	100	4,500	5,450	6,400	7,200
By user type					
General Aviation	64,600	363,450	398,600	431,150	447,000
Air Taxi	650	3,700	4,000	4,400	4,500
Military	0	350	400	450	500
Aircraft Operations Distribution					
Peak Month	6,806	38,300	42,000	45,500	47,100
Peak Week	1,697	9,550	10,500	11,300	11,700
Average Day of Peak Month	225	1,250	1,400	1,500	1,550
Peak Hour (Avg.Day-Peak Mo.)	40	205	225	235	235

Source: Wadell Engineering Corporation

TABLE 3
WADELL ENGINEERING CORPORATION AVIATION FORECAST MODEL
SAN JOSE/FREMONT GENERAL AVIATION RELIEVER AIRPORT STUDY
MOFFETT JOINT-USE - BASED AIRCRAFT & OPERATIONS FORECAST

	1980	1985	1990	1995	2000
Based Aircraft:					
Single Engine	0	342	443	443	443
Multiple Engine	0	74	96	96	96
Helicopter	0	9	11	11	11
Total	0	425	550	550	550
Annual Aircraft Operations:					
By type of operation					
Local	0	169,500	223,500	227,000	230,500
Itinerant	0	128,000	175,500	185,500	196,000
Total	0	297,500	399,000	412,500	426,500
Instrument Operations	0	10,600	14,200	14,600	15,100
Actual Inst. Approaches	0	2,650	3,550	3,650	3,800
By aircraft type					
Single Engine	0	239,400	321,400	332,250	343,500
Multiple Engine	0	51,800	69,600	72,000	74,500
Helicopter	0	6,300	8,000	8,250	8,500
By user type					
General Aviation	0	297,500	399,000	412,500	426,500
Aircraft Operations Distribution					
Peak Month	0	31,000	41,600	43,000	44,500
Peak Week	0	7,750	10,400	10,700	11,100
Average Day of Peak Month	0	1,000	1,350	1,400	1,450
Peak Hour (Avg.Day-Peak Mo.)	0	165	215	215	220

Source: Wadell Engineering Corporation

3. DEMAND/CAPACITY ANALYSIS AND FACILITY REQUIREMENTS

The capacity analysis and facility requirements are based on guidelines established in FAA Advisory Circulars, FAA Regulations, and good planning and engineering judgment. Facility requirements are matched with the forecast of aviation demand to provide for the safe, efficient and convenient utilization of the airport sites without unreasonable delays. It should be recognized that on the basis of demand, this chapter merely identifies items and quantities for input to the Site Selection and Airport Plans section of the report. Actual recommended development is identified in the Financial Plan section, where all of the physical and financial aspects of the proposed development are brought together.

An airport is composed of a number of major elements which contribute to its overall size and shape. The principal components include:

- Airfield
  - Runways
  - Taxiways
- Airspace/Navaids
- Terminal Area
  - Aprons
  - Buildings
  - Auto Parking
- Support Facilities

This section discusses the facilities required to accommodate the forecast aviation demand. Each of the major facility requirement categories noted above is described separately.

AIRFIELD AREA

Future airport development should be capable of satisfying airfield dimensional clearance criteria governing runways and taxiways at a general aviation airport as shown in the following table. These clearances include separations between runway centerline and taxiway centerline, obstacle, apron, building line and property line. In addition, other general aviation standards such as runway/taxiway widths and slopes and safety areas are shown in the table.

Runway.

Airports are classified as a function of their use and runway length.

TABLE 4
GENERAL AVIATION AIRPORT STANDARDS

ITEM	BASIC UTILITY STAGE I	BASIC UTILITY STAGE II	GENERAL UTILITY
Widths			
Runway (R/W)	50 ft.	60 ft.	75 ft.
Taxiway (T/W)	20	30	40
Safety Area	100	120	150
Clearance (R/W C/L to)			
T/W Centerline (C/L)	150 ft.	150 ft.	200 ft.
Obstacle	200	200	250
Apron	200	200	250
Building Line	200	200	250
Property Line	200	200	250
	(250 ft. min. on T/W side of R/W)		
R/W & T/W Slopes			
Longitudinal	0-2%	0-2%	0-2%
Transverse	1-2%	1-2%	1-2%
Apron Slope	1%-2%	1%-2%	1%-2%
Radius of Fillet	50 ft.	50 ft.	50 ft.
R/W Edge to Holding Line	50 ft.	50 ft.	50 ft.
Parallel R/W C/L Separation	300 ft.	300 ft.	500 ft.
Safety Area Beyond R/W End	200 ft.	200 ft.	200 ft.
Shoulder Slopes R/W & T/W	3% to 5% for 10 ft. then 1.5% to 5% to edge of safety area (150′ typical).		
R/W Grade Change	0% to 0.33% per 100 ft. of vertical curve & no vertical curve required if grade change is less than 0.4%.		
R/W Sight Distance	Without 24 hr. tower any 2 points 5 ft. above R/W C/L must be mutually visible for entire R/W length.		

Above standards were obtained from the following FAA publication: AC 150/5300-4B CHG 5 Utility Airports. Some dimensions will vary based on airport configuration.

Runway Length.

Runway length is determined analytically by evaluating the elevation of the airport above mean sea level and the design temperature, which is the mean of the maximum temperature during the hottest month of the year. An assumed design elevation of sea level and a critical temperature of 78.3°F was used. Based on these figures the runway length requirements table was prepared. The Basic Utility Stage I type of airport accommodates about 75 percent of the propeller airplanes under 12,500 lbs. It is primarily intended to serve low-activity locations, small population communities, and remote recreation areas. The Basic Utility Stage II type of airport accommodates about 95 percent of the propeller aircraft under 12,500 lbs., while the General Utility Airport will accommodate all propeller aircraft less than 12,500 lbs.

The "Basic Transport" or business jet runway length requirements are based on aircraft size and useful load carried. The 60 percent level of business jet fleet includes all business jets weighing up to 30,000 pounds, typically the smaller business jets. The 100 percent fleet includes the largest planes up to 60,000 pounds, such as the Gulfstream II.

Business jet traffic in Santa Clara and Alameda Counties is adequately served and accommodated by other existing aviation facilities. The advisability or desirability of providing facilities to accommodate these aircraft will depend on increases in this type of traffic. Forecasts, however, indicate that the demand at the site areas will be composed entirely of aircraft other than jets.

TABLE 5
RUNWAY LENGTH REQUIREMENTS*

Airport Classification	Runway Length
Existing Fremont	2310 ft.
Existing Moffett Field	9200 ft.
Basic Utility I:	2400 ft.
Basic Utility II:	3000 ft.
General Utility:	3500 ft.
Commuter:	4100 ft.
Basic Transport:**	
60%/60%	4600 ft.
60%/90%	5900 ft.
100%/60%	5000 ft.
100%/90%	7300 ft.

* Assumes sea level elevation, 78.3° mean maximum temperature of hottest month.

** The first percent indicates aircraft size within the business jet fleet; the second percent is the amount of useful load carried.

Runway Orientation.

The configuration of the airport is determined by the number of and orientation of the runways. The primary factors related to the number of runways required are airfield capacity and demand. One of the primary factors influencing runway orientation is wind.

FAA criteria for a utility airport specify that a crosswind runway is required if the primary runway is oriented so that the crosswind on it exceeds 11.5 miles per hour (10 knots) more than 5 percent of the time (thus providing less than 95 percent wind coverage). Where a single runway orientation does not provide this usability factor of at least 95 percent, the airport system should include a crosswind runway.

Number of Runways.

An analysis of the number of runways required to achieve optimum airfield capacity was undertaken. This analysis was based on the Federal Aviation Administration (FAA) methods for estimating airfield capacity and for determining the relationship between level of operations and aircraft delays.

A runway capacity analysis was performed to determine the hourly and annual operational capacity of alternative airfield configurations. Factors considered in the analysis include aircraft mix, airfield layout, runway use, weather, and runway exit locations. As a result, a single runway airport developed under standard conditions with good parallel taxiway system and runway exits would have an annual capacity of 250,000 landings and takeoffs, while a parallel runway system could handle as many as 550,000 annual operations. An intersecting runway system would have about 475,000 annual operations.

Runway Strength.

The runway strength is determined by the airport runway category and type of aircraft expected to operate at the airport. Basic Utility Stage II and General Utility airports have pavement strengths of 8,000 and 12,500 pounds, respectively.

Taxiways.

The addition of taxiways increases the airport operational efficiency and the runway capacity potential. As a minimum for a fundamental airport, taxiway turnarounds at both ends of the runway are recommended. Based on existing demand, a full parallel taxiway with appropriate exits is recommended to meet forecast demand and provide adequate safety.

AIRSPACE/NAVAIDS

With the forecast volumes of traffic it is expected that an air traffic control tower would be required. Towers are eligible for federal funding when airports approach 200,000 annual runway movements, the entry-level criteria for new FAA tower commissioning.

Federal Aviation Regulations (FAR) Part 77 establishes standards for determining obstructions in navigable airspace. These standards make a distinction in the criteria for approaches to runways with differing approach procedures. Based upon the landing approach for the individual runway, the three basic distinctions made in FAR Part 77 are: visual approach, nonprecision instrument approach, and precision instrument approach. The slope and dimensions of the approach surface for each end of a runway are described in the Airspace Clearance Requirements table. Operational demand is expected to be sufficient to qualify for a precision instrument runway in the future; however, a nonprecision approach should be planned initially to establish actual traffic counts for FAA justification to install navaids.

Runway/Taxiway Markings.

For unpaved runways, man-made markers defining the physical limits of a dirt or turf runway are recommended. For paved runways, white runway numbers and centerline stripes are recommended. Yellow taxiway markings along the centerline and a transverse holding line 50 feet from the runway edge are recommended.

Visual Aids.

The following visual aids and markings are considered to be the minimum necessary at a good public general aviation airport:

- Two box Visual Approach Slope Indicator System (VASI)
- Medium Intensity Runway Lights (MIRL)
- Lighted wind cone
- Basic runway markings (as described above)
- Segmented circle
- Rotating beacon
- Runway End Identifier Lights (REIL)

TERMINAL AREA

Terminal area requirements include: airplane parking and tiedown, buildings and hangars, and roads and auto parking. The Preliminary Facility Requirements table presents the summary of necessary facilities assuming a Fremont area site were developed.

Airplane Parking and Tiedown.

The aircraft tiedown parking requirements are identified in the Facility Requirements table based upon projections of demand for the airport. It is assumed that 75 percent of all based aircraft will be parked on tiedown positions, and a factor of 10 percent of total based aircraft reflects transient parking demand. The number of tiedown spaces required ranges from 78 in the year 1980 to 485 in the year 2000.

Buildings and Hangars.

The number of hangars depends upon local demand and climate. It is estimated that a reasonable hangar demand would be 25 percent of total based aircraft since the climate in the Bay Area is not severe. T-hangars are quite costly in terms of monthly rental. Although many pilots will indicate interest in having a hangar, when they find out the actual cost they will often prefer to remain with tiedown accommodation. The hangar demand ranges from 22 spaces in 1980 to 140 by the year 2000.

TABLE 6
AIRSPACE CLEARANCE REQUIREMENTS

	LARGER THAN UTILITY RUNWAYS		UTILITY RUNWAYS	
	Precision Instrument Approach(a)	Non-Precision Instrument Approach(b)	Visual Approach	Non-Precision Instrument Approach
APPROACH SURFACE:				
Width at inner end (primary surface width)	1,000′	1,000′	250	500′
Width at outer end	16,000′	4,000′	1,250′	2,000′
Length	50,000′	10,000′	5,000′	5,000′
Slope	50:1/40:1(c)	34:1	20:1	20:1
CLEAR ZONE:				
Width at inner end	1,000′	1,000′	250′	500′
Width at outer end	1,750′	1,510′	450′	800′
Length	2,500′	1,700′	1,000′	1,000′

a. Instrument Landing System
b. Visibility minimums as low as 3/4 mile
c. Precision instrument approach slope is 50:1 for inner 10,000′ and 40:1 for additional 40,000′.

Source: Federal Aviation Regulations, Volume XI, Part 77, "Objects Affecting Navigable Airspace, U.S. Department of Transportation, Federal Aviation Administration."

AC 150/5300-4B, Utility Airports

Fixed based operator (FBO) building areas are also included in the table. It is preferred to have a few well qualified full service FBO operations versus many scattered small businesses. The acreage requirements exclude public apron areas and public auto parking.

Fixed based operator lease areas and hangars are revenue producing facilities. Their timely development is essential for growth of the airport and production of revenues to be used for matching funds. The positive benefits of these facilities will be derived if the facilities are built when sufficient demand exists, thereby assuring the success of the building development program.

Airport buildings should be constructed to fulfill specific needs. These needs include fixed based operators buildings providing repair and maintenance, air charter, shops, salesroom and administrative buildings accommodating the public including pilots, passengers, and visitors. The General Aviation Terminal Area Operational Factors table indicates there will be 315 persons using terminal area facilities during the typical busy hour in 2000. Initially it is expected that FBO lobbies will adequately handle the general aviation terminal building needs. However, a separate free standing terminal/administration building is highly desirable when FBO lobbies become crowded.

TABLE 7
GENERAL AVIATION TERMINAL AREA OPERATIONAL FACTORS

FREMONT AREA SITE	1980	1985	1990	1995	2000
(1) Busy Hour Aircraft Operations	40	205	225	235	235
(2) Itinerant Operations (busy hour)	14	90	100	103	103
(3) Itinerant Pilots and Passengers (2) x 2.5	35	225	250	258	258
(4) Local Aircraft Operations (busy hour)	26	115	125	132	132
(5) Local Aircraft Pilots and Passengers (4) x 1.75	45	200	220	232	232
(6) Total Pilots and Passengers	80	425	470	490	490
(7) Pilots and Passengers Within the Terminal Area*	45	275	305	315	315

*Assumes facilities are used by all itinerant aircraft, and 25 percent of local aircraft.

Source: Wadell Engineering Corporation

Roads and Auto Parking.

Access to the airport is very important if the airport is to meet demand levels. A minimum two-lane all weather road from a major transportation roadway facility leading directly to the site should be provided for access to the airport. Auto parking for the year 2000 is estimated to be 755 spaces.

SUPPORT FACILITIES

Support facilities for an airport include communications, fuel storage and distribution, electric power, water supplies, waste water disposal, and storm water collection and disposal. Availability of these facilities are highly desireable in the operation of an airport.

LAND AREA REQUIREMENTS

The initial step in any airport development is the determination of sufficient land to ensure that (1) the airport can accommodate the long term air traffic requirements, and (2) the land area contains airport operational areas under appropriate control to ensure compatibility of land use around the airport. The amount of land needed can vary considerably in size depending on many factors including landing area (e.g., length, number, and layout of runways and taxiways), approach areas (e.g., clear zones), and building area (e.g., T-hangars, aircraft tiedowns, buildings, auto parking). Specific land area requirements are subject to siting and layout and therefore are discussed later in this report.

The foregoing comments about facilities required during the planning period are direct input to the Site Selection and Airport Plans chapters and are used in developing physical layouts. Once the layouts are prepared, quantities are determined and serve as the basis for the Schedules and Cost Estimates chapter of the feasibility study.

TABLE 8
FACILITY REQUIREMENTS SUMMARY
FREMONT AREA SITE

	1980	1985	1990	1995	2000
Demand					
Based Aircraft	90	490	520	545	565
Aircraft Operations	65,250	367,500	403,000	436,000	452,000
Airfield Facilities					
Runways - Number	1	2	2	2	2
Length	3,000′	3,500′	3,500′	3,500′	3,500′
Width	60′	75′	75′	75′	75′
Strength	8,000	12,500	12,500	12,500	12,500
Terminal Facilities					
FBO Area - Tenants	1	3	4	4	5
Acres	3.0	9.0	12.0	12.0	15.0
Auto Parking - Spaces	120	650	695	725	755
Acres	1.0	5.2	5.6	5.8	6.0
Hangars - Spaces	22	122	130	135	140
Acres	2.8	15.3	16.3	16.9	17.5
Open Tiedown Spaces					
Based	68	368	390	410	425
Transient	10	45	50	55	60
Open Tiedown Acres					
Based	5.7	30.7	32.5	34.2	35.4
Transient	1.0	4.5	5.0	5.5	6.0
Total Terminal Area Acres	13.5	64.7	71.4	74.4	79.9
Access					
Access Road Lanes	2	2	2	2	2
Daily Vehicle Trips	180	3725	3950	4150	4300
Peak Hour Trips	35	420	445	465	480

NOTE: Acreage requirements will vary depending on specific site layout and geometrics.

4. SITE SELECTION

The previous chapters of this report identified the general needs and facility requirements in the study area specifically as they relate to Moffett Field and Fremont Airport. The purpose of this chapter is to identify the capability of the existing sites and suitability of other potential sites to satisfy the forecast needs and travel demands. Such a site must not only meet aeronautical and physical requirements, it must also be sufficiently cost effective, convenient for users, and capable of development with minimal negative environmental consequences.

The site evaluation and site selection phase is an important stage of this study. Today, there is increasing pressure at several airports to reduce general aviation operations. Combined with the increased popularity of general aviation flying in recent years, more and better general aviation facilities are needed. Yet many airports are being closed down for the development of housing, shopping centers, and other land uses. Thus, it is important that a number of planning criteria be considered in the site evaluation and site selection to ensure that a new airport will exist beyond the current planning period. The principal criteria in the long term development of any site are 1) to ensure that sufficient land is available to meet long-term air traffic requirements, and 2) to ensure that compatible land uses around the site will be developed under appropriate controls.

Thus, the development of an airport to serve the South Bay area should be planned as an airport having a capability suited to training and personal/business-use flying related to the airport service area.

Criteria used in the evaluation of the alternative sites (to be discussed subsequently) include considerations of four major factors: 1) operations; 2) environmental impact; 3) engineering; and 4) cost.

AIRPORT DEVELOPMENT CONCEPTS

In performing analyses leading to a recommended program which sets forth measures for improvement, expansion, and development of aviation facilities in the study area, three basic airport development concepts have been established for consideration in this study. These concepts are described as:

Concept A - "Do nothing." Construct no new facilities and continue to use the existing private airport.

Concept B - "Expand an existing airport." Construct new and/or expanded facilities at Moffett and/or Fremont to satisfy the forecast demands over the 20-year planning period.

Concept C - "Construct a new airport." Close the existing airport and construct a new airport in the vicinity of Fremont to satisfy the forecast demand over the 20-year planning period.

EVALUATION OF THE EXISTING AIRPORTS

Fremont Airport: Background and Existing Conditions

Fremont Airport is a privately operated, open-to-the-public general aviation airport located in the City of Fremont, California. The airport is situated in the southwesternmost portion of Fremont, west of the Nimitz Freeway. Access to the airport is via Dixon Landing Road. The land on which the airport is developed, as well as adjoining land to the east and north, is owned by Rogers Properties of El Cerrito. The Fremont Airport has held a use permit from the City of Fremont since 1964 although the airport existed at the site prior to that date. In 1975 the Fremont General Plan was revised and, for the first time, the City's proposed general aviation airport site was designated as the Fremont Airport.

The current airport operator is also the FBO, Fremont Flying Service. Approximately 70 acres are leased by the operator on a month-to-month basis from Rogers Properties. At present, there are 90 based aircraft at the facility and, with the exception of three multi-engine aircraft, all are single engine props. A waiting list with the names of more than a hundred people who have applied for parking space at the airport exists, though the list is not considered particularly current.

The airport's single paved runway, Runway 13-31, is 40 feet wide and 2,310 feet long. The June 1980 FAA Form 5010, the airport master record, indicates that the runway, taxiway, and apron are in poor condition as a result of breaking asphalt. There is also an obstruction on center line approximately 1000 feet south of the threshold of Runway 31.

Notwithstanding the short runway, poor condition of the airfield, and obstruction at the south end of the runway, the safety record for operations at the facility compares favorably with other area airports. Between January of 1978 and July of 1980, only a single accident report and two incident reports were filed for the airport. (The determination of what constitutes "accidents" and "incidents" is based on National Transportation Safety Board criteria).

One of the more serious problems encountered at the airport were three episodes of flooding, in 1977, 1979, and 1982. In the first instance, a combination of heavy rains and high tides resulted in inundation of much of the facility. In 1979, in part as a result of increased development on the hillside east of the airport and the subsequent increase in runoff, flooding occurred on a portion of the airport. This second incident of flooding also took place at the time of a high tide and the Alameda County Flood Control District's floodgates in the channel north of the airport operate only at low tide. The flood control channel has been dredged by the County since the 1979 flooding.

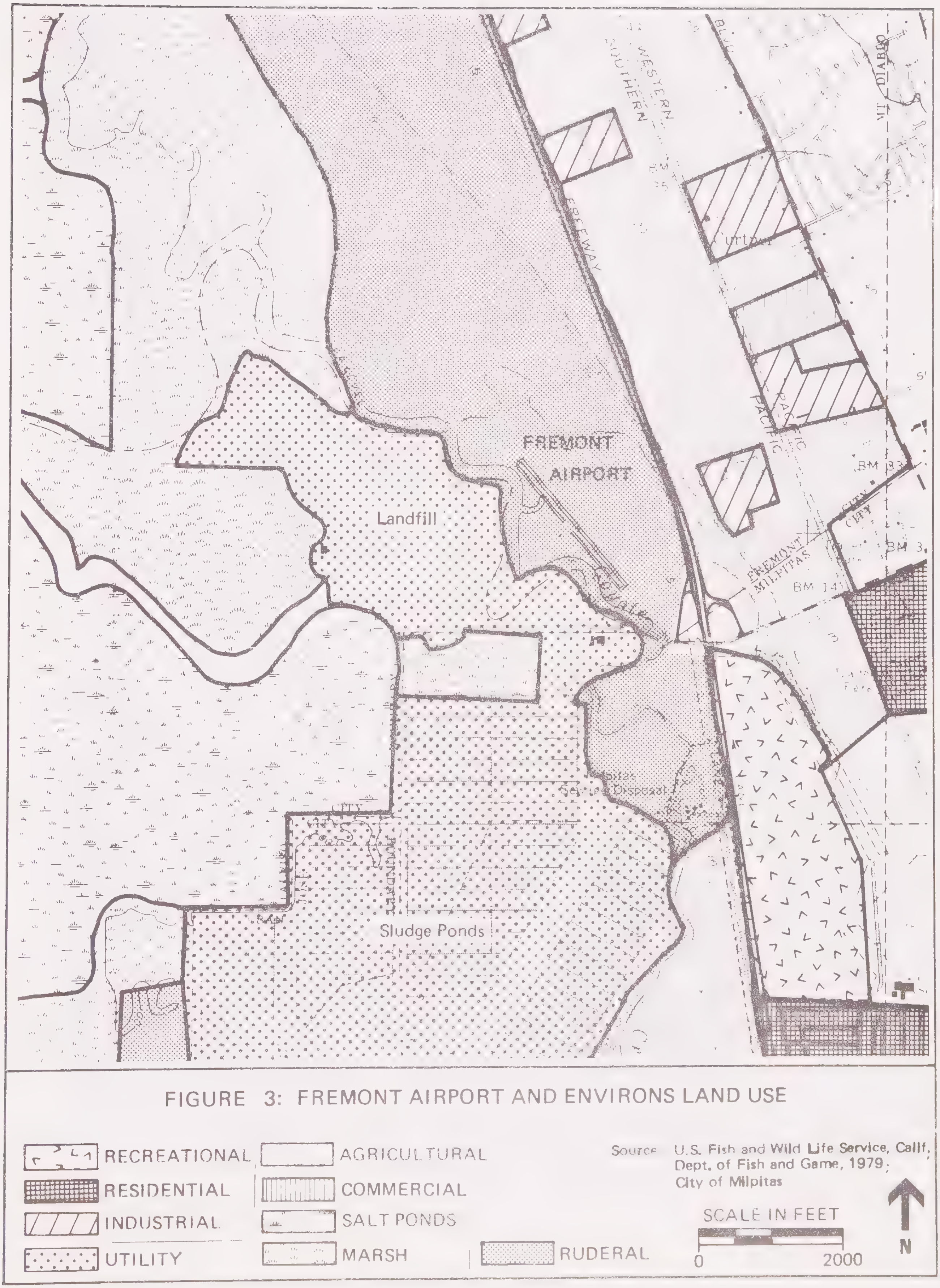


FIGURE 3: FREMONT AIRPORT AND ENVIRONS LAND USE

Fremont Airport has a large number of touch and go operations, including operations by aircraft based at other facilities in the Bay Area. Approximately 80-85 percent of all take-offs and landings occur to the north. The typical flight pattern for operations is a left turn on Runway 31 and a right turn on Runway 13. This pattern is intended to keep traffic west of the airport, away from developed areas. However, since this is uncontrolled airspace and some aircraft based at Fremont don't have radios, control of aircraft in the vicinity is considered difficult.

The City of Milpitas has registered concern regarding the future use and development of Fremont Airport and the subsequent impacts which might immediately southeast of the airport. A project has been approved by the City for converting the Dixon Landing Golf Course, which is close by the airport, to a mixed use development. The project includes 422 residential dwelling units, together with industrial uses. Several trailer parks, which are considered permanent uses by the City, lie approximately three-quarters of a mile east of the southern tip of the runway. Particular concern has been expressed for noise impact on this development by Milpitas officials and citizens.

The airport operator reports no complaints regarding noise. Bird strikes from the adjacent Newby Island landfill occur occasionally during pilot training. When normal patterns at normal elevations are followed, there is no bird strike problem.

Moffett Field NAS: Background and Existing Conditions

Moffett Field Naval Air Station is operated by the Department of the Navy and is open only to Department of Defense aircraft and civilian aircraft based on prior agreement. The airport is located six miles northwest of the San Jose Airport and has a field elevation 34 feet above mean sea level. There are two parallel runways 625 feet from centerline to centerline. Runway 14L-32R is 9200 feet by 200 feet and is constructed of portland cement concrete. Runway 14R-32L is 8124 feet by 200 feet and is asphalt with concrete ends. Runway 32L has a 607 foot displaced landing threshold due to the proximity of Bayshore Freeway. The landing approach to Runways 32L and 32R require 75 foot clearance above Bayshore Freeway with aircraft turning their final approach no less than one mile from the landing threshold. Both runways have pavement strength greater than 50,000 pound single wheel, 112,000 pounds dual wheel, and 257,000 pounds dual tandem. The airfield has vast hangar and aircraft parking facilities for the Navy aircraft and provides all necessary fuel and maintenance for the Navy operations.

The location of Moffett Field in the densely urbanized South Bay results in overflights of populated areas. This has been a particular concern of the cities of Sunnyvale and Mountain View because of the noise impact and safety implications. Both cities have worked with Moffett to reduce those impacts. Moffett has attempted to develop good community relations and to solicit the cooperation of pilots in carrying out an aggressive noise abatement program. The Navy's procedures require utmost caution

FIGURE 4: MOFFETT FIELD AND ENVIRONS
SUNNYVALE LAND USE/ZONING

MOFFETT FIELD BOUNDARY
RESIDENTIAL
RECREATIONAL
INDUSTRIAL
SCALE IN FEET
0 2000

when flying over populated areas, and directs pilots to avoid power changes and maneuvers that may create a noise nuisance. Touch-and-go landing practice is not authorized between the hours of 2200 and 0800. The facility's procedures limit the number of military aircraft in the traffic pattern at any one time to no more than four aircraft.

In mid 1973, the Navy transferred the bulk of the P-3 aircraft touch-and-go traffic to other military airfields. The number of annual operations dropped from the then-current approximately 112,000. The Navy has made more extensive use of flight simulators as well as utilization of other airports in order to reduce the number of military movements. The Navy reports a reduction in civil complaints from occupants of the airport environs. Currently, the Navy does not allow more than 35 touch-and-go landings each day. In a recent year, there were approximately 69,000 total operations of which 32,000 were military. The remainder was general aviation and air carrier aircraft operating under aviation facility licenses. The general aviation aircraft are primarily those operated by the Aero Club based at Moffett, as well as flights by NASA aircraft.

Because of the apparent relatively low level of use of the airfield facilities when compared to Moffett NAS airfield capacity, an opportunity exists for general aviation aircraft training or based aircraft to utilize some of the available capacity. In 1979, the City of San Jose contacted the Department of Navy as well as several Congressmen and a Senator to initiate discussion of joint use of Moffett Field NAS for touch-and-go training activity of general aviation aircraft, primarily as a method of relieving the congestion in the South Bay area. The Navy's response was that the joint civil and military use of NAS Moffett Field as proposed by the City is impractical. The Navy assured the City that they would cooperate in every possible way to reduce the potential for accident hazard in the South Bay area. In terms of specific policy and criteria, the Secretary of Navy has stated that controlled joint use of Navy airfields is permitted when requested by an authorized governmental agency if it is determined that:

a. such an arrangement will be mutually beneficial,

b. the security of military operations, facilities, or equipment will not be compromised,

c. military flight operations will not be substantially impaired,

d. air safety will not be degraded,

e. there is no other reasonable alternative (such as an existing or planned civil airport in the area), and

f. the proposed joint user is an authorized state or local governmental agency willing and able to assume the obligations inherent in such joint undertakings, including capital expenditures for parking areas, taxiways, terminal, maintenance, and fuel facilities, if required.

SELECTION OF ALTERNATE AIRPORT SITES

An evaluation leading to identification and selection of potential new airport sites was undertaken.

The steps undertaken in the site selections were:

- Identification of previous sites analyzed in other studies.
- Identification of other geographic areas capable of accommodating a new airport.
- Preliminary screening of sites.
- Selection of specific airport sites.

Identification of Previous Sites Analyzed in Other Studies

Over the years, there has been discussion and consideration as to whether Fremont Airport most adequately serves the areas airport needs or whether a new site should be developed. Discussion and limited study has considered areas such as salt ponds, and vacant lands north and south.

Identification of Other Areas Capable of Accommodating a New Airport

The initial step in identifying other geographic areas as alternative airport sites was to analyze the terrain conditions in the study area. Because FAA criteria require that a general aviation airport runway be constructed with an overall gradient not to exceed two percent, reasonably level terrain was identified. It is desirable, therefore, to consider new airport sites on which longitudinal and transverse slopes are two percent or less to minimize earthwork and site grading requirements during airport construction. This factor considers not only the runway longitudinal slope but also takes into account the requirement to minimize cross-slopes for the taxiways and in the apron areas.

Preliminary Screening of Available Areas

Several site areas in the vicinity of Fremont were thus identified for consideration. Once all reasonable airport sites were located, they were screened on the basis of five key planning criteria to eliminate those that were clearly less attractive. The factors considered in this screening process were: (1) overall size; (2) accessibility; (3) site area development; (4) site topography; and (5) obstructions.

Overall Size

Based on the preliminary land area requirements set forth, an area of approximately up to 250 acres has been estimated to be an appropriate "plan for" size for any new airport in the study area. The results of this evaluation indicate that all site areas should meet this requirement. Relocation of roads, homes, and other physical facilities may be necessary to obtain adequate acreage.

Accessibility

It is desirable that the site area should be within a reasonable driving time and/or distance within the demand area. Responses from a aircraft owners show that airport convenience is a prime reason for basing at the existing airport.

Development

In determining the proper location of an airport, the community growth trends must be considered to avoid incompatible land uses around the airport. It is ideal to locate an airport in a relatively undeveloped area where land use control zoning can be easily implemented. All alternate site areas are located on currently vacant land.

Topography

As mentioned previously, it is desirable to consider new airport sites on which the longitudinal and transverse slopes are two percent or less to minimize earthwork and site grading requirements during airport construction. Results of the evaluation indicate that all sites meet this requirement.

Obstruction

Specific considerations of site slope, power lines, and roadways become an important consideration in the overall orientations of the runways. The capability of the site area to satisfy terrain obstructions based on Federal Aviation Regulations Part 77, "Objects Affecting Navigable Airspace," can have a significant effect in reducing costly earthwork and relocation of power lines or roadways. An analysis of approach surface clearances from visual to precision capabilities was performed for each site area. The results of this evaluation indicate that visual approaches are possible at all sites.

Selection of Specific Airport Sites

As a result of the preceding steps undertaken, several airport sites were selected for more detailed evaluation. Then, numerous potential airfield alignments were investigated which indicated the general location and layout of facilities, assuming a 3,500 foot runway, parallel taxiways, and suitable terminal area facilities. A preliminary airfield alignment was finally selected in order to appropriately analyze and compare the sites.

The overall runway orientation at each site was based on the consideration of the three major factors: 1) wind, 2) terrain obstructions, and 3) potential impact on surrounding development. The result of this analysis produced a runway system layout for each site. Many other potential airfield alignments are possible. However, based on the above criteria, the selected configurations appear reasonable for comparative purposes.

Wind

Because aircraft cannot tolerate excessive crosswinds, runway alignment is dependent on wind direction and velocity. Since wind recordings demonstrate that the prevailing winds normally generate from a northwest direction, most of the runway orientations investigated considered alignments in that direction.

Terrain Obstructions

Specific considerations of site slope, power lines, and roadways become particularly important in the overall orientations of the runway. Significant earthwork and relocation of transmission lines or roadways can be very costly. Hence, altering alignments to minimize the site development costs and obstructions was considered. The analysis was based on criteria contained in Federal Aviation Regulation, Part 77.

Surrounding Development

Land use plans by regional and local jurisdictions and private developers were reviewed. In determining the proper location of an airport, the community growth trends must be considered to avoid incompatible land uses around the airport. It is ideal to locate an airport in a relatively undeveloped area where land use control zoning can be easily implemented. Although the search areas contained sparsely populated regions, consideration of surrounding area development and land uses affecting runway alignment was necessary to minimize incompatible uses.

NEW SITE IDENTIFICATION AND DESCRIPTION

At the outset of this study, both Fremont Airport and joint use of Moffett Field were identified for evaluation as potential general aviation reliever facilities for San Jose Municipal Airport. A third "new" site was to be identified during the course of the study itself so that all three options could be compared to one another.

To identify a new site, three elementary criteria were established to help define the general geographic area of investigation and to narrow in on specific locations. The first criteria was based on the need to find a site near San Jose Airport since this was the area in which general aviation demand has been shown to exist. Second, because of the high level of aviation activity within the Bay Area, it was crucial to minimize airspace conflicts with existing area airports. Finally, a large vacant site was necessary where adjacent land uses would be compatible with an airport.

These considerations quickly narrowed the search area to the southeast corner of San Francisco Bay, east of Moffett Field, generally in the vicinity of the Alameda/Santa Clara County line. Because of the proximity of San Jose Municipal Airport, airspace conflicts effectively preclude development of a new facility south of Highway 237. Existing development or commitments to development east of Highway 17 (Nimitz Freeway) generally exclude that area from consideration as a potential airport site. The northern boundary of the search area was defined by

Hayward Air Terminal airspace, transmission lines, and incompatible existing land use in the area, primarily in the form of residential development.

The potential new reliever airport search areas thus included the land north of State Route 237, west of Highway 17, and south of the transmission lines which cross Highway 17 near Durham Road in Fremont. San Francisco Bay forms the westerly boundary of the area.

Within this geographic area, seven vacant sites were identified as being of both sufficient size for an airport and free of apparent airspace conflicts; further, land adjacent the sites appeared compatible with airport development. Maps of these six sites showing current and planned land use, existing zoning, and jurisdictional boundaries were prepared.

These six site areas and the specific issues considered regarding airport development at each of the sites were:

> <u>AREA A</u> is approximately 250 acres in size and lies west of the Nimitz Freeway, across from the General Motors assembly plant. The parcel is bound by Durham Road on the north, Highway 17 on the east, Cushing Road on the south, and Boyce Road on the west. All land in Area A is owned by the Southern Pacific Land Company; leases include the Fremont Raceway /Dragstrip and Skysailing Airport, a heavily-used glider facility. Remaining portions of the area are in pasture/agricultural and some industrial use. The site is entirely within the city limits of Fremont.
>
> <u>Discussion</u>: When contacted regarding the potential of Area A as a general aviation airport site, the Southern Pacific Land Company indicated it felt an airport would be incompatible with future industrial development planned for the area and that the Company would "oppose violently" any attempt to apply an airport designation on its property. Southern Pacific indicated that both the Fremont Raceway and Skysailing Airport had termination provisions in their contracts with Southern Pacific which the Company could exercise quickly if the potential for industrial development were to suddenly arise. Southern Pacific has no immediate plans for development of the area, although it indicates that some utilities have been installed in the area and that the Company is willing to have development occur at any time.
>
> <u>AREA B</u> is a triangular parcel of approximately 175 acres in size bound by West Warren Avenue on the north, Highway 17 on the east, and PG&E transmission lines on the west. The site lies wholly within the Fremont city limits, is zoned industrial, and is currently vacant. It is generally referred to as the "Cole-Reed property," after an earlier owner of the land. The site has been acquired by Renco Properties Inc. of Santa Clara.

Discussion: This area was rezoned to a Restricted Industrial District in 1981. A tentative map for industrial development was approved by the Planning Commission on June 11, 1981. The impacts of concern noted by Fremont in the rezoning and tentative map process - as in a somewhat similar development proposal for Site C, discussed below - include drainage, freeway interchange impacts, and the potential consequence of airport development on the proposed use. Devcon indicates that development of the site may begin in a years time, although full buildout may not occur for at least five years.

AREA C lies immediately adjacent to and west of Area B. It covers approximately 595 acres and is bound by West Warren on the north, transmission lines to the east, and by levies on the north, west, and south. The site is within the City of Fremont city limits and is privately owned; approximately 50 percent of the area is in marsh.

Discussion: Area C has been under option to Fremont International Partners who are preparing plans for an industrial park which would occupy 268 acres along the easternmost boundary of the site extending into the area east of the Fremont Airport and west of the Nimitz. Because of a marsh along the western edge of the site, a large portion of Area C has been effectively rendered unbuildable because of environmental regulations and requirements of the various public authorities with jurisdiction in the area.

Fremont International Partners submitted a preliminary industrial park plan to the City of Fremont for staff consideration in September, 1980. An environmental impact report on that project was approved by the City Council on September 22, 1981. The property was rezoned to Restricted Industrial and Open Space on September 22, 1981. The Planning Commission approved a tentative map for the project on September 24, 1981.

AREA D is a 1000-acre salt evaporation pond bound by Coyote Creek on the north, the San Jose city limit to the east and south, and a tributary of Coyote Creek on the west. It lies within Santa Clara County, Alameda County, adjacent to the line and is owned by Leslie Salt. Transmission lines bisect the site and the entire area is levied.

Discussion: Area D abuts the San Francisco Bay National Wildlife Refuge Complex on the north and west. The Refuge, which is managed by the U.S. Fish and Wildlife Service, is a wintering ground for migratory birds and is the only major estuary between Puget Sound and the Mexican border. In 1979, more than 15,000 acres in the southeastern portion of the Bay were conveyed to the U.S. Fish and Wildlife Service for the wildlife complex. This was the result of an adjudicated settlement with Leslie Salt Company. While land owned by Leslie on the north and west of Area D were included in that

property transfer, Area D was not. The Fish and Wildlife Service indicate that development of an airport at this site would degrade the quality of the refuge since aircraft would appear raptor-like to birds and wildlife could be affected by the noise and air quality impacts of overflying aircraft. Further complicating potential development of the site is that several listed endangered species have been noted in the area, including the clapper rail and the salt marsh harvest mouse. These species have also been observed along the western edge of Area C.

Leslie Salt Company indicates that twenty years ago the City of San Jose attempted to secure this area (known as the "A-12" pond) for use as an oxidation pond. The matter was subjected to litigation and resulted in Leslie retaining ownership and control over the area. Leslie indicates that it would be reluctant to give up this parcel and suggested that development of an airport at this site might be opposed by such agencies as the San Francisco Bay Conservation and Development Commission and the U.S. Army Corps of Engineers.

AREA E is approximately 250 acres and portions of the site lie within either the City of San Jose or unincorporated Santa Clara County. Area E is bounded by the San Jose/Santa Clara sewage treatment facility settling ponds on the north, Coyote Creek on the east, and Highway 237 on the south. The area is currently in agricultural use and also functions as a buffer for the chlorine hazards associated with San Jose/Santa Clara sewage treatment plant. Area E is owned by the City of San Jose.

Discussion: The unincorporated portion of Area E falls within the City of San Jose's sphere of influence and is shown for industrial use on the San Jose General Plan. A "sphere of influence" indicates a city's ultimate boundary and gives that city the authority to plan within the designated area. Because Area E lies within the City's chlorine hazard buffer zone, it has been surrounded by existing or proposed industrial or quasi-industrial uses to the north, west, south, and east. The manager of San Jose-Santa Clara Water Pollution Central Plant reports that planning has been completed for a $44 million sludge handling facility to be constructed at the site. A chlorine hazard study done by the City indicates a high potential hazard within one mile of the existing sewage treatment plant in the event of an accidental release of chlorine gas.

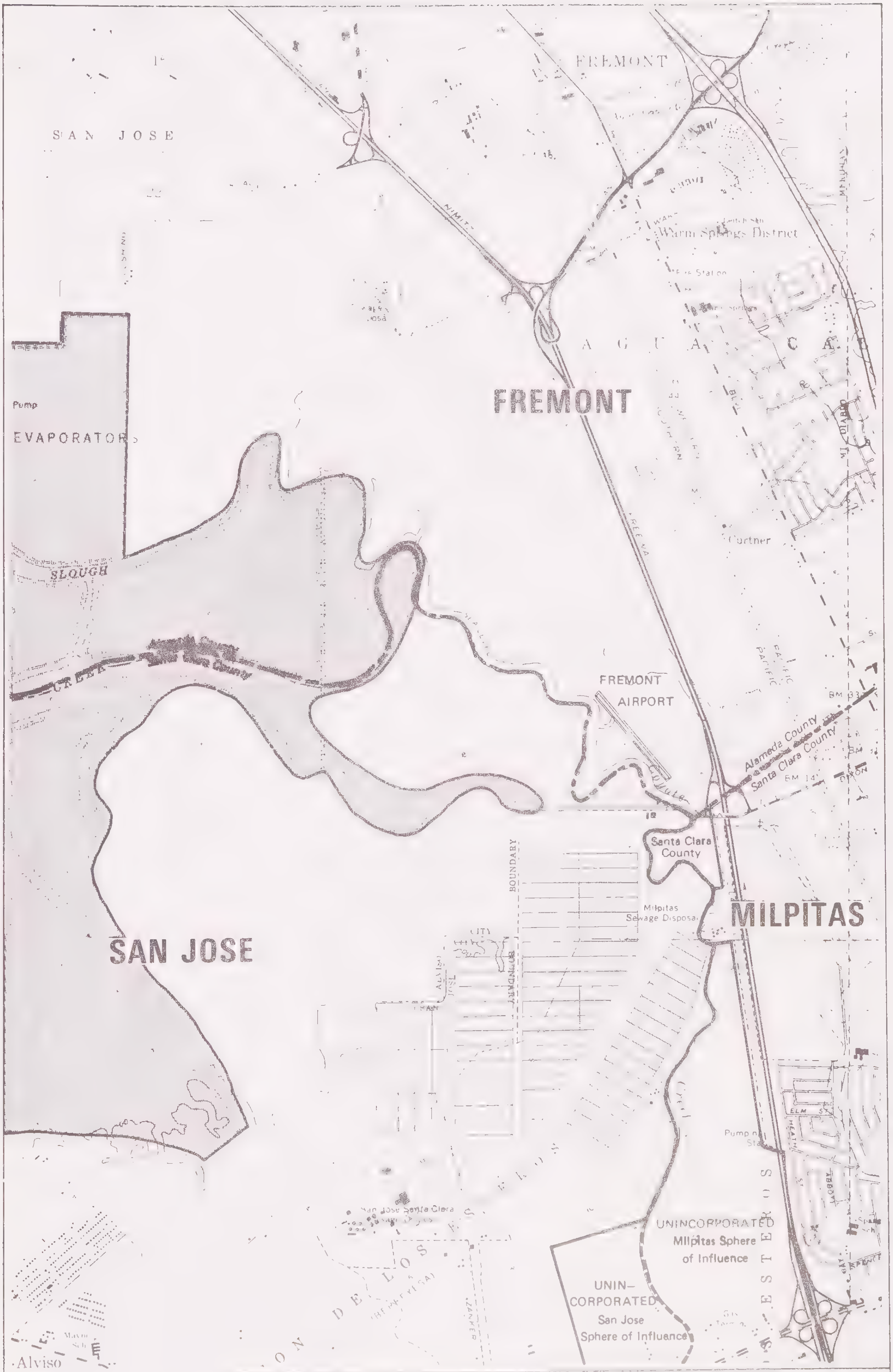


FIGURE 5: JURISDICTIONAL BOUNDARIES

SAN FRANCISCO BAY NATIONAL WILDLIFE REFUGE COMPLEX

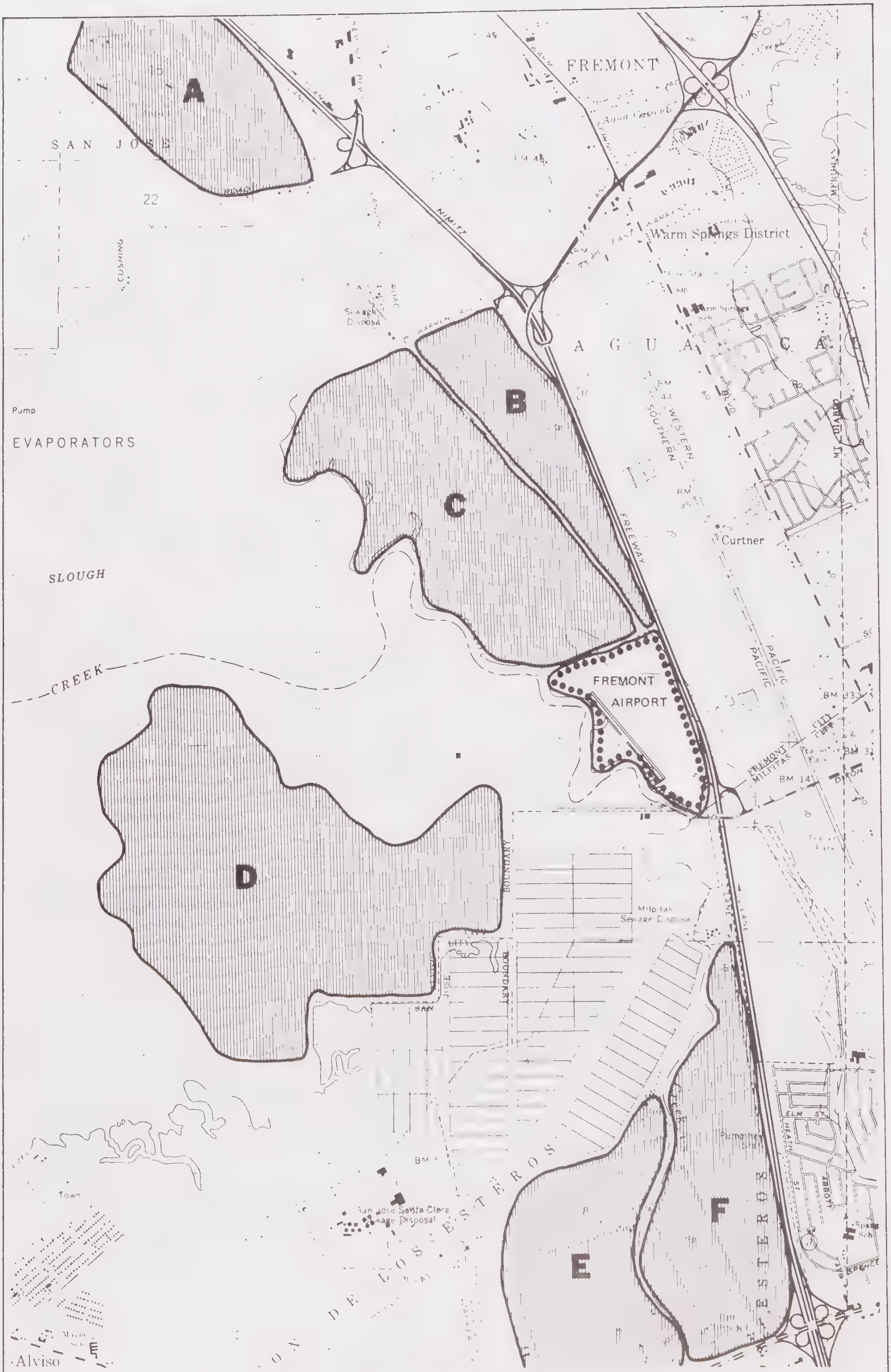


FIGURE 6: PRELIMINARY SITE IDENTIFICATION

SCALE IN FEET
0 2000
N

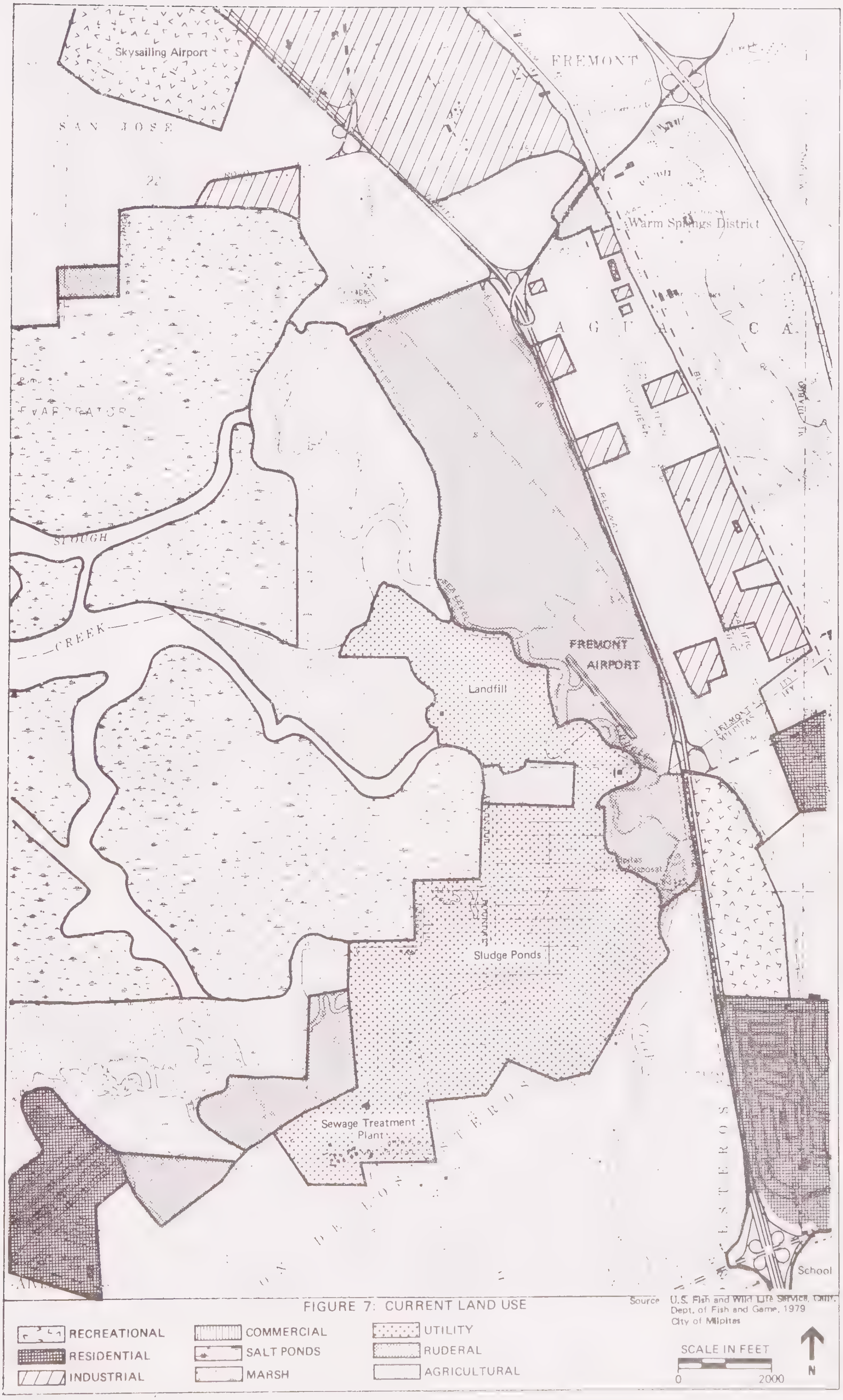


FIGURE 7: CURRENT LAND USE

Source: U.S. Fish and Wild Life Service, Calif. Dept. of Fish and Game, 1979
City of Milpitas

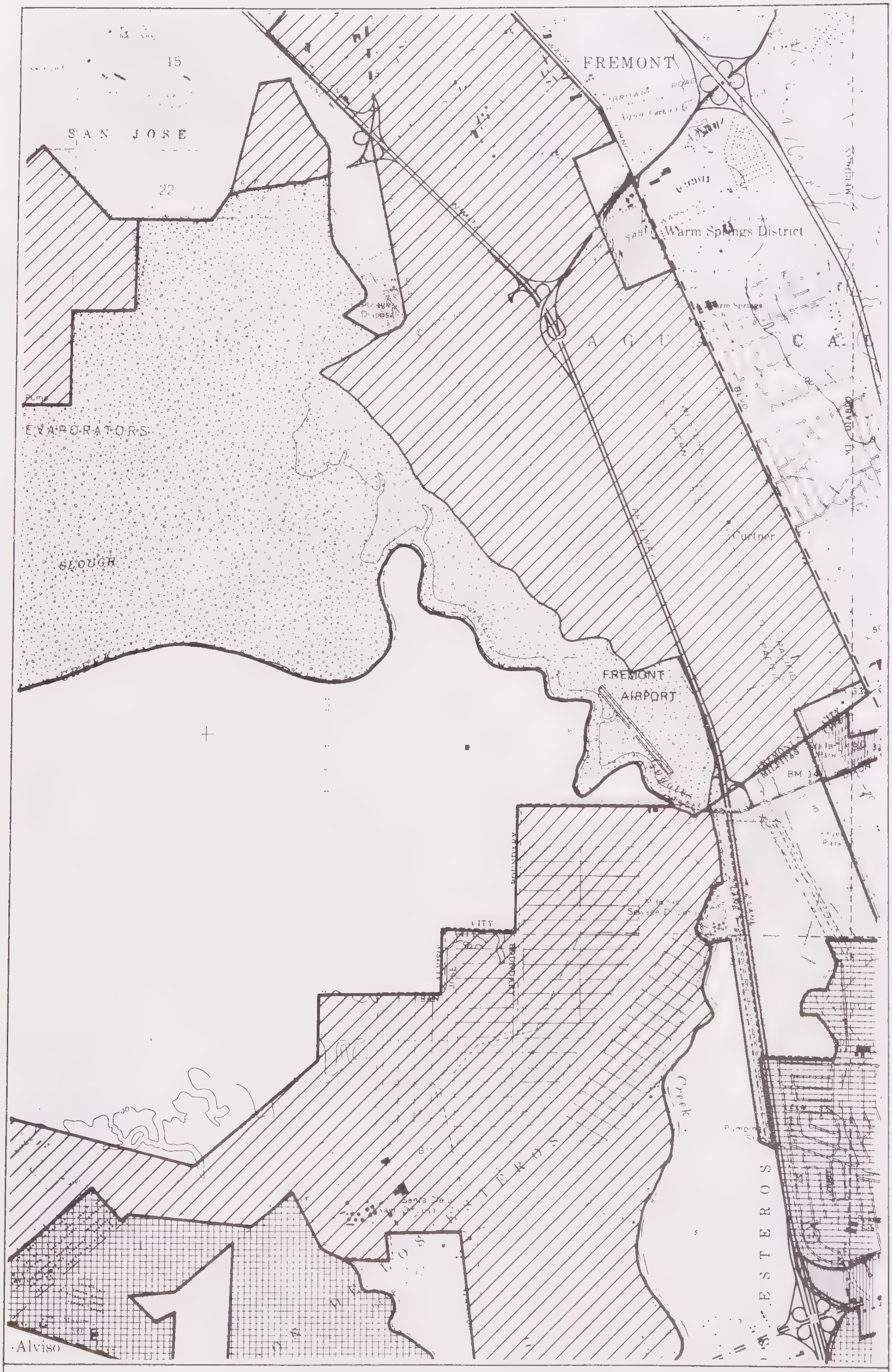


FIGURE 8: CURRENT ZONING (GENERALIZED)

AGRICULTURE	RESIDENTIAL	
AGRICULTURAL–FLOODPLAIN	COMMERCIAL	INDUSTRIAL

Source: San Jose Zoning Maps, 1980, Fremont Zoning Maps, Milpitas Zoning Map

SCALE IN FEET
0 2000
N

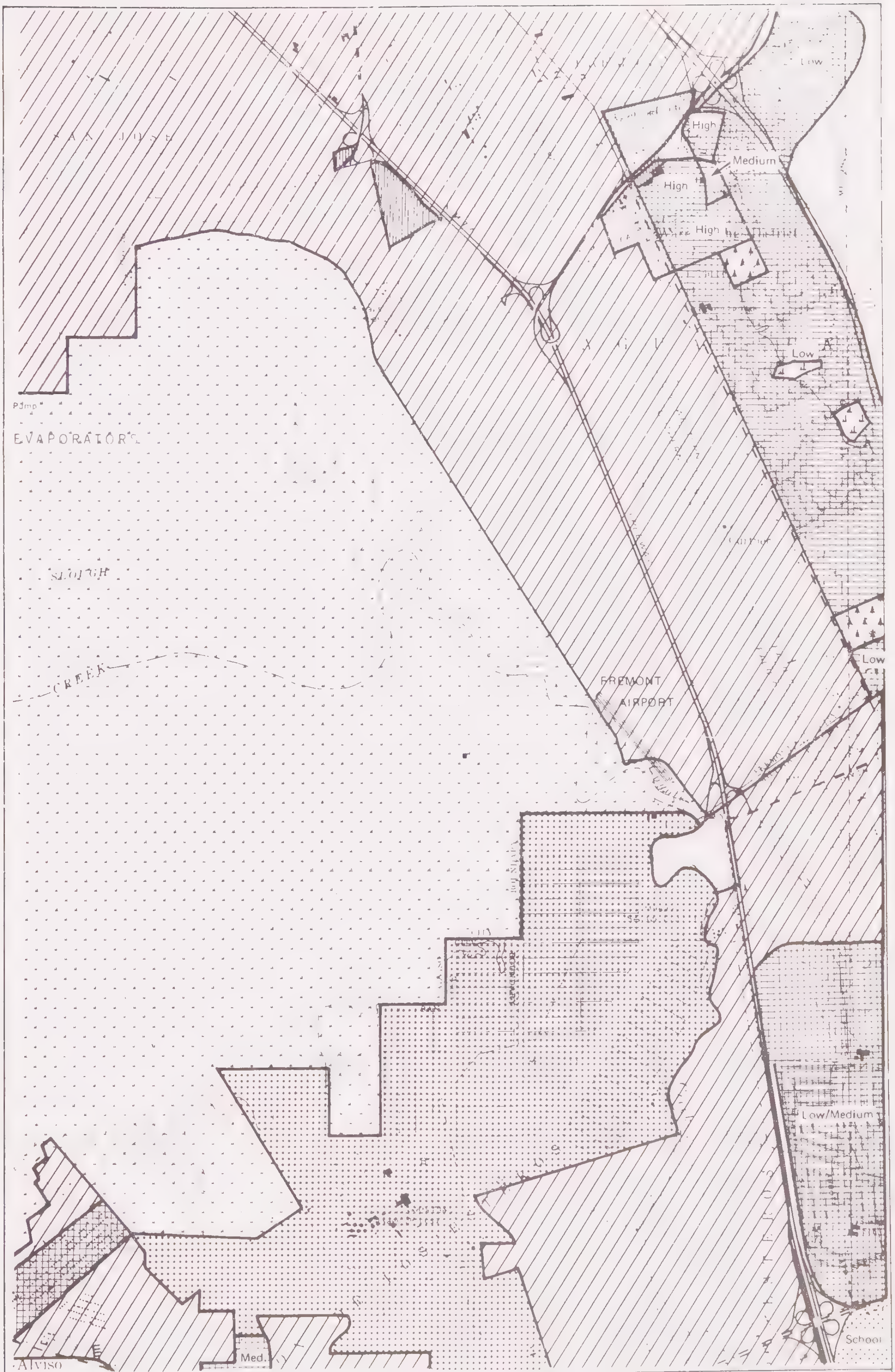


FIGURE 9: GENERAL PLAN LAND USE

SOURCE Fremont General Plan
San Jose General Plan
Milpitas General Plan

OPEN SPACE
RECREATION
RESIDENTIAL (Density)
COMMERCIAL
INDUSTRIAL
PUBLIC / QUASI-PUBLIC

SCALE IN FEET
0 2000
N

AREA F is a triangular land area of approximately 280 acres bound by Highway 17 on the east, Highway 237 on the south, and Coyote Creek on the west. The area is in an unincorporated portion of Santa Clara County and is currently in agricultural use. The land is in private ownership.

Discussion: Area F lies within the City of Milpitas' sphere of influence. The site is shown in the Milpitas General Plan for industrial development. East of Area F is an existing low density residential use and southeast is Calaveras High School. While the school is located on that portion of its site farthest from Area F, some discussion has occurred regarding selling the portion of the site nearest Area F for high density residential development. To the south of Area F is agriculturally used land which is zoned industrial, but on which an EIR is now being prepared for an industrial park development. It is anticipated that development in this southern area will begin in approximately three years. New mixed use development (residential, industrial, commercial) is currently being investigated for the area east of Area F which now includes the Dixon Landing Golf Course. It is anticipated that industrial uses and between 600-900 residential units may be developed between Highway 17, Dixon Landing Road, the Southern Pacific Rail Line, and the existing residential development to the south.

Area G is approximately 400 acres in size. It lies southeasterly of Durham Road at the northeasterly side of the Southern Pacific Transportation Company's main line railroad. It is bounded on the northeast by the Pacific Gas and Electric Company's high-voltage transmission lines. The southerly end of the area projects into salt evaporation ponds owned by the SF Bay National Wildlife Refuge and operated by the Leslie Salt Company. The Pacific Gas and Electric Company's Newark Substation is located northwesterly of Area G, at the northwesterly side of Durham Road. The Oakland Scavenger Company's 258-acre Durham Road Landfill is located at the southwesterly side of the Southern Pacific Transportation Company's 1 Market Street Properties subsidiary and by the United States government. The site is presently used for pasture/agricultural and salt pond uses. The site is entirely within the city limits of Fremont.

Discussion: Area G was designated by the City of Fremont as a future general aviation airport site as a result of a Citizens Airport Advisory Committee 1959 study. An FAA site investigation report was completed for this site in 1960. This FAA study found the site could be developed as a general aviation airport facility, from an engineering standpoint. One Market Street Properties, Inc. acquired a portion of the property in Area G for the purpose of expanding its industrial property holdings, and to construct railroad access from its main line to other industrial lands southeasterly of Boyce Road. One Market Street Properties, Inc., along with Marjorie

McInerney, applied to the City of Fremont for a general plan amendment in 1975 to change the designation of their respective properties within Area G from airport to industrial. The application was approved. One Market Street Properties, Inc. subsequently acquired the McInerney property for industrial development. The remaining lands at the southerly end of Area G have been acquired by the United States government for the San Francisco Bay National Wildlife Refuge. The general plan location for the future Fremont Airport was changed to the present Fremont airport site in 1976.

Based on this review, two conditions became clear. First, much of the vacant land in the South Bay survey area may only be theoretically available for a new general aviation airport since land is being subjected to considerable development pressure. While the initial identification of sites did not attempt to determine the actual availability of any parcel for airport development, it appears that many of the sites - and the adjacent areas - are only temporarily undeveloped. The opportunities for a new airport site in the area are diminishing based exclusively on land availability.

A second important factor to consider in discussing airport development at these sites is that there are myriad public agencies which have jurisdiction and/or interest in development in, on, or immediately adjacent to San Francisco Bay. At minimum, development of a new facility, or even expansion of the Fremont Airport, may involve approvals and/or negotiations with the U.S. Department of Fish and Wildlife, the California State Division of Fish and Game, the Army Corps of Engineers, the San Francisco Bay Conservation and Development Commission, and the State Lands Commission. Involvement with these agencies is, of course, in addition to approvals which may be required from individual city, county, and regional jurisdictions which normally participate in any development approval process.

Having gone through this comparative evaluation, the least promising of the sites appeared to be A, D, E, F and G. The rationale is generally traceable to a dominant characteristic or issue associated with each site. In the case of Area A, difficulties may be encountered in trying to designate the area as an airport site, especially in view of the opposition of the Southern Pacific Land Company and the fact that there has been an investment in services for the area. Area D lies close to the San Francisco Bay National Wildlife Refuge Complex and, for all intents and purposes, may be considered virtually a portion of the complex. Major environmental difficulties would likely be encountered in an attempt to develop this site as an airport. Area E represents two difficulties: it lies within the chlorine hazard zone identified by the City of San Jose and it is the site for a planned sludge treatment facility. Issues associated with Area F are a consequence both of the proximity of existing and planned residential uses as well as local policy. Because residential uses are well established and additional ones planned for the area east of the site, there is a potential for land use conflicts given the proximity of these residences to the airport. As well, the City of Milpitas has indicated strong reservations associated

with airport development adjacent to the City, and thus may be reluctant to consider the development of a general aviation facility within what will eventually become a portion of Milpitas. Area G is no longer available as a site, and does not have general plan site designation.

Two sites remain: Areas B and C. The westerly half of Area C is in marsh and therefore unavailable for development. Because the useful land available in Area C constitutes a narrow strip along the eastern edge of the site, it does not lend itself to typical airport layout geometrics. As a result, the new airport site for final comparison is a combination of portions of Areas B and C. The airfield area would be on C, while access systems and portions of the terminal area would be on B. Hereafter, this combined area will be referred to as Site B/C.

COMPARATIVE SITE EVALUATION

A comparison of the three site alternatives with regard to the major factors influencing the selection of the general aviation airport site is described below and is illustrated in a qualitative comparison matrix tabulation at the end of this chapter. The three sites are existing Fremont, Moffett Field N.A.S., and Site B/C.

The factors influencing the selection of the general aviation airport site have been categorized into four areas and include many of the same factors considered in the new site selection described earlier:

OPERATIONAL FACTORS

- Airspace
- Terrain Obstruction
- Wind
- Visibility
- Accessibility

ENVIRONMENTAL FACTORS

- Natural Environment
- Social Environment

ENGINEERING FACTORS

- Topography and Drainage
- Soil
- Utilities
- Relocation

COST FACTORS

- Land Acquisition
- Construction
- Other

OPERATIONAL FACTORS

Conditions that affect the airport operations have an important influence on the capability of the airport to reach its full potential. These operational factors include airspace and obstructions, wind, visibility, and airport accessibility.

Airspace and Obstructions. A preliminary evaluation of each airport site from an airspace standpoint governed by Federal Aviation Regulations has been performed. A formal airspace review is essential to ensure the alternative sites would provide safe and efficient use of the airspace in the area.

All three of the potential sites can function quite adequately as visual flight rule airports. Moffett Field currently has instrument approach procedures, and an instrument landing system (ILS) could be readily installed for general aviation use. The existing Fremont site and Site B/C have quite similar airspace due to their proximity to one another, however the latter is in closer proximity to power transmission lines and therefore approach minima may be greater. Either site is capable of non-precision approach procedures and depending on FAA allocation of airspace and procedures, an instrument landing system at the existing Fremont Airport could be a possibility.

Wind. Because general aviation aircraft cannot tolerate excessive crosswinds, runway alignment is dependent upon wind direction and velocity. The existing Moffett Field has adequate wind coverage and functions quite well. Since the two Fremont area sites have not been developed as public airports, there are no on-site wind data records available. It is important to note, however, that use of the existing runway at Fremont has been found to be workable relative to wind coverage and therefore neither of the Fremont area sites is expected to be disadvantaged in terms of wind coverage or turbulence.

Visibility. Visibility problems as created by smoke, snow, glare, or fog conditions can have a profound effect on the operations of an airport. The spacing required between aircraft is greater when visibility is poor. Because of the proximity of the sites to one another, it is difficult to differentiate among each in terms of visibility. No unusual visibility problems appear to exist at any of the sites.

Airport Accessibility. Accessibility is the ability of potential users to conveniently reach the airport from their place of origin. Convenience can be measured in terms of time and/or cost. If the airport is remotely located from the demand centers, it will not be able to serve the needs of the community and, thus, will not be able to reach its full development potential. Airport access times and distances were considered and evaluated for each of the potential sites; existing and proposed transportation systems for the area were reviewed; the requirements for new or improved access roads were determined. All sites are conveniently accessible from the San Jose/Fremont area and no unusual off-airport roadway systems would be required. Moffett Field is served by both the Bayshore Freeway (U.S. 101) and Highway 237 (Alviso-Milpitas

Road). The 1980 Santa Clara County General Plan indicates that morning rush-hour congestion along highways 237 and 101 in the vicinity of Moffett Field is expected to intensify by 1990. The County recommends upgrading 237 to freeway standards between Highway 17 and the Lawrence Expressway, thereby increasing capacity along this route.

Fremont Airport is served primarily by the Nimitz Freeway (Highway 17), with access available to the Fremont Airport from the Dixon Landing interchange. Site B/C has access from the Mission Boulevard//Warren Avenue interchange. Santa Clara County and the City of Fremont have proposed that additional lanes be provided for Highway 17 between U.S. 101 and the Santa Clara County line. North of Fremont Airport and Site B/C are two other freeway interchanges: Mission Boulevard and Fremont Boulevard. The City of Fremont intends to undertake roadway modifications in the vicinity of Fremont Boulevard and the Nimitz Freeway that will provide smoother flow for Fremont Boulevard traffic (east of the Nimitz) to Dixon Landing Road (west of the Nimitz). Landing Road is the de facto extension of Fremont Boulevard. Present expectations are that a southerly extension of Landing Road would be constructed which would run through Site C and ultimately connect with the Dixon Landing Road interchange. The availability of this roadway upgrading would considerably enhance ease of access to both Site B/C as well as to the existing Fremont Airport.

ENVIRONMENTAL FACTORS

A preliminary evaluation of environmental factors at each of the sites was performed for the purpose of comparative analysis. Sites which offer the least environmental impact and the most compatibility with airport activities will be given preference. In this analysis two general areas of impact, natural and social environment, will be described.

Natural Environment. All sites, to some degree, will impact the natural ecology of the area. The least construction would take place at Moffett Field since all airfield facilities currently exist. The maximum development would take place at Site B/C since it is currently undeveloped. Even the existing Fremont Airport would require significant construction since not all facilities are usable as is, due to existing grades and the need to meet minimum FAA standards. The Fremont area sites could be considered flood prone although development of either site would require consideration of the possible effects of existing and future drainage problems. Therefore, planning would have to consider the necessity of adequate facility development to handle runoff and drainage conditions. Through proper development, either site should be capable of withstanding reasonable flood hazards.

Moffett Field, existing Fremont Airport, and Site B/C all lie within the seismically active San Francisco Bay area. The San Andreas Fault, the Hayward Fault, and the Calaveras Fault - three of the major active faults of northern California - are within 2 to 20 miles of each airport site and therefore have the potential to cause damage at all sites. Shrink-swell soil hazard areas are always considerations in airport development. Shrink-swell potential is an indication of the volume change of soil that can be expected with changes in moisture content. Soil with high shrink-

swell potential can present hazards to maintenance of engineering structures. Moffett Field, because it is located farther inland from the edge of the Bay than the other sites has greater soil stability. Development of either of the two Fremont area sites would involve consideration of soil problems related to development on Bay mud. Landslide is not a factor for any of the sites, however subsistance and liquefaction problems may be associated in particular with development at either of the Fremont sites, again due to construction on Bay mud.

No significant wildlife habitats have been identified at Moffett Field since it is a currently developed facility. On the other hand, the two Fremont area sites have a significant wildlife and natural habitat area to the west, particularly in the presence of the San Francisco Bay National Wildlife Refuge Complex. As land is put into urban use, the natural food, cover, and water for wildlife species typically disappears. The nature of airport development anticipated is significant and therefore implications for wildlife habitat aspect are considered important, in particular for the Fremont area sites. Because Fremont Airport and Site B/C are so close to one another, impacts on the Wildlife Refuge are considered similar for each site. However, development at Site B/C may represent significant marshland encroachment and thus cause somewhat more disruption to the natural environment.

The contribution of air pollution from aircraft and ground vehicle operations is not anticipated to differ significantly among the three sites. The amounts of air pollutant emissions should be analyzed in greater detail in future environmental impact report studies. Since the Bay Area is densely populated, the air pollution levels are relatively high from urbanized use. Water quality problems are relatively minor. During construction careful preventive measures can be expected to insure that no further degradation of water quality occurs.

<u>Social Environment</u>. No historical or archeological sites are known to exist within each of the potential airport sites. However, only limited surveys have taken place. Generally, potential archeological areas can be expected to be near springs, around lakes or Bay shorelines. An Alameda County Planning Department Handbook on Archeology in Alameda County indicates the present Fremont airport B/C sites have minimal to moderate archeological sensitivity. All three potential sites are located within drainage areas and further archeological surveys must be performed. No major park and recreation areas are located within the site areas, although the San Francisco Bay National Wildlife Refuge Complex lies near all sites.

Removal of agricultural land is a consideration in terms of an alteration of an established use, although it is not a major factor. Currently, portions of Moffett Field are cultivated and further development there would reduce available land for agricultural use. The existing Fremont site is currently developed as an airport, and Site B/C in general planned for industrial use and would be developed either as an airport or as an industrial park. None of the proposed sites, if developed, would require displacing residents. Similarly, given the nature of the terrain at each site, significant visual impact is highly unlikely.

Land use plans of regional and local jurisdictions were reviewed as part of the site evaluation process. The proper siting of an airport must consider the land uses surrounding the airport site and also take into account community growth trends to ensure compatibility and acceptability in the vicinity of the airport. It is most desirable for land use compatibility to locate an airport in a relatively undeveloped area where land use controls such as zoning can be easily implemented. Where undeveloped land still remains, pressures for future development persist. Therefore, a key to ensuring a long term, continued use of the airport is to develop and enact land use zoning legislation to protect the investment made in the development and operation of the airport and to prevent future problems. Both Moffett and the existing Fremont Airports are recognized as aviation facilities and are in current aviation use. While it is also recognized that the public has acknowledged and become familiar with activity levels and patterns at both facilites, it is important to note that increased activity at either site may result in increased concern by surrounding communities. Since Site B/C is not currently in use at an airport, it has not been accepted by neighbors in the environs as generating impacts typically associated with a general aviation facility. Construction of a new airport at Site B/C would conflict with plans for an industrial park at that location.

Noise is one of the most controversial effects of airport operations. The technique commonly used to describe the aviation noise environment is the Community Noise Equivalent Level (CNEL), the standard recognized by the State of California. The acceptability of noise exposure over areas of impact can be generally evaluated based on the relationship between CNEL contours and people's typical response to the noise levels. (See Section 6 of this report for more detail on noise measurement and impact.)

Existing (1980) and future (2000) average sound levels were prepared for the existing Fremont Airport using the methodology prescribed in the FAA's "Developing Noise Exposure Contours for General Aviation Airports" (FAA-AS-75-1). Using the same methodology, noise contours were prepared for Site B/C and Moffett Field at the year 2000 level of operation. Because of the considerable number of operations forecast for that time, parallel runways were considered desirable at the existing Fremont Airport site and at Site B/C. For purposes of comparison, the existing two runways at Moffett Field were used in developing contours, although it is likely that only a single runway would be used at Moffett as part of a joint military/civil use program.

While distinct CNEL contour values are presented graphically, it should be understood that the actual noise environment changes gradually to either side of a contour line. This means that the noise contour is not as permanent and fixed as depicted, but that it shifts based on a number of variables such as pilot technique, weather, takeoff and landing profiles, weight loads, and so on.

Noise impacts are considered to have a low to moderate effect on human activities when average daily exposure is less than 65 CNEL, although some uses especially sensitive to noise require insulation at or below this level. Because all three sites are located in areas generally surrounded by industrial uses and in proximity to intensively used

transportation corridors, aviation-generated noise will be masked by other sounds at relatively short distances from the runways and, in some cases, will not even be a discernible element in the noise environment. While noises associated with adjacent industrial uses and auto and truck traffic on the Nimitz Freeway and the Bayshore Freeway will vary with the time of day, they are generally of a more constant nature than the noise produced by aircraft operations. Since traffic noise and that produced by industrial activity can play significant roles in defining the background noise levels, the perceived aircraft noise level may be lower than what may otherwise be expected in simply looking at the airport noise contours.

For the San Jose-Fremont site feasibility analysis, noise modeling assumptions were:

1. Aviation forecasts are those prepared for this study. Mean day operations are equal to the annual operations divided by 365.

2. Distribution of aircraft operations in time is 100 percent day and evening (7:00 A.M. - 10:00 P.M.) and zero percent night (10:00 P.M. to 7:00 A.M.).

3. Runway lengths are:

Year	Fremont Airport	Site B/C	Moffett Field
1980	Runway 13-31:2310′	-	Runway 14L-32R:9200′ Runway 14R-32L:8124′
2000	Runway 12R-30L:3500′ Runway 12L-30R:3000′	Runway 12R-30L:3000′ Runway 12L-30R:3500′	Runway 14L-32R:9200′ Runway 14R-32L:8124′

4. Annual operations by type of aircraft

1980:	Fremont Airport 13-31
Single engine	62,975
Multi-engine	2,175
Helicopter	100

2000:	Fremont Airport		Site B/C		Moffett Field	
	12R-30L	12L-30R	12R-30L	12L-30R	14L-32R	14R-32L
Single engine	176,800	222,400	222,400	176,800	176,800	222,400
Multi-engine	45,600	-	-	45,600	45,600	-
Helicopter	3,600	3,600	3,600	3,600	3,600	3,600

5. The annual allocation of runway operations is based on wind direction, i.e., the wind blows predominantly from the north and northwest, and that during conditions of calm, operations to the north are preferred since they minimize flights above developed

urban areas. At Fremont Airport and Site B/C, 90 percent of the annual operations per runway is allocated to Runways 30L and 30R; 10 percent of the operations is allocated to Runways 12L and 12R. At Moffett Field, 90 percent of the operations assigned per runway is allocated to Runways 32L and 32R; 10 percent of the operations assigned per runway is allocated to Runways 14R and 14L.

6. Because the FAA publication has no technique for evaluating helicopter noise, and inasmuch as such noise is different in character, duration, and perceived human impact than noise generated by fixed wing aircraft, helicopter operations were not included in calculations.

Available land areas and soil considerations on the existing Fremont site permit a longer runway (3500 feet) to be developed on the west and a shorter runway (3000 feet) on the east as well as an intersecting runway system. On Site B/C, however, because of the limitations of that site, the 3000 foot runway is established on the west and the 3500 foot runway on the east. The shorter runway carries the bulk of touch-and-go operations. Because the longer runway carries most multi-engine aircraft operations, noise impact shifts from the west in the Fremont airport site to the east in Site B/C.

Flight patterns depicted on the noise contour maps are standard patterns which do not necessarily reflect habits of local pilots. For purposes of site comparison, runway utilization and flight patterns were assumed to be similar at all sites. Since parallel runways would be necessary to handle operations forecast for the year 2000 at Fremont Airport and Site B/C, they were also assumed used at Moffett. (Actual runway utilization at Moffett Field can only be determined after additional consultation with the Navy and could, for example, result in using the 9200′ Runway 14L-32R as if it were two tandem runways, thereby having some aircraft land mid-field). As a result, the CNEL noise generated by general aviation aircraft are comparable at each site. General aviation aircraft noise would probably be least noticeable at Moffett Field since high level noise contours would only extend short distances from the runway and would be masked by military aircraft noise. At the Fremont sites, noise levels would be much the same regardless of which locations were selected, and the degree of annoyance to area residents would depend entirely on how land around the site was allowed to develop. At both Fremont sites, areas subject to noise levels of 65 CNEL and above are planned for industrial development and would thus be compatible with the forecast noise levels. At Moffett Field, areas subject general aviation noise levels of 65 CNEL and above are already developed in industrial uses and would thus represent compatible adjacent land uses.

The ambient noise level at both of the Fremont sites under consideration would increase as a result of airport development. However, the degree of impact is considered relatively minor inasmuch as high noise levels are confined to a small area immediately on or adjacent to the airport itself. There are no incompatible uses developed around the airport sites to be affected by noise. Traffic on the Nimitz Freeway in combination with sounds from other industrial uses in the area are likely to be the most dominant and recognizable noise generators in the area

FIGURE 10:
MOFFETT FIELD 2000 CNEL CONTOURS
(NEW GENERAL AVIATION OPERATIONS ONLY)

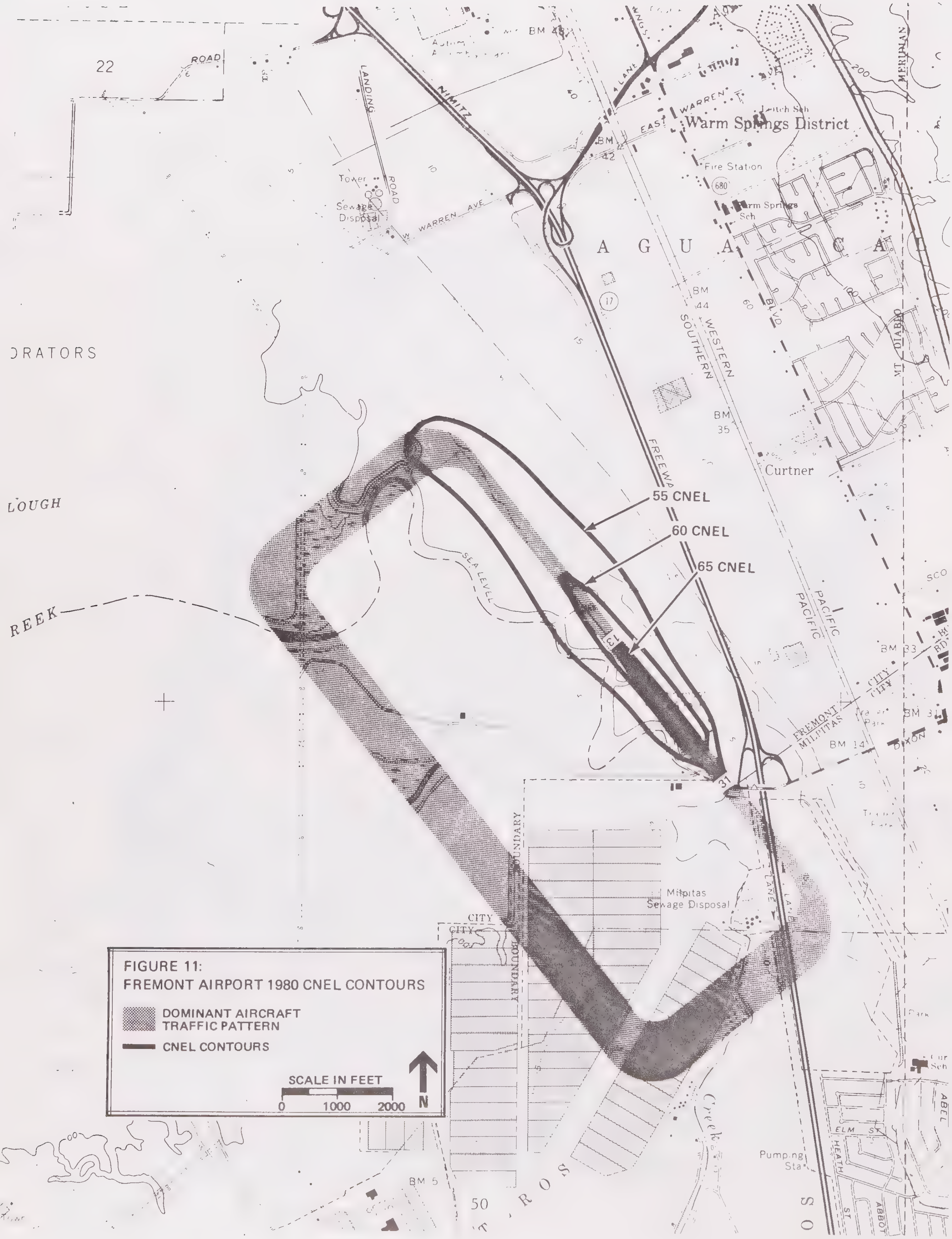
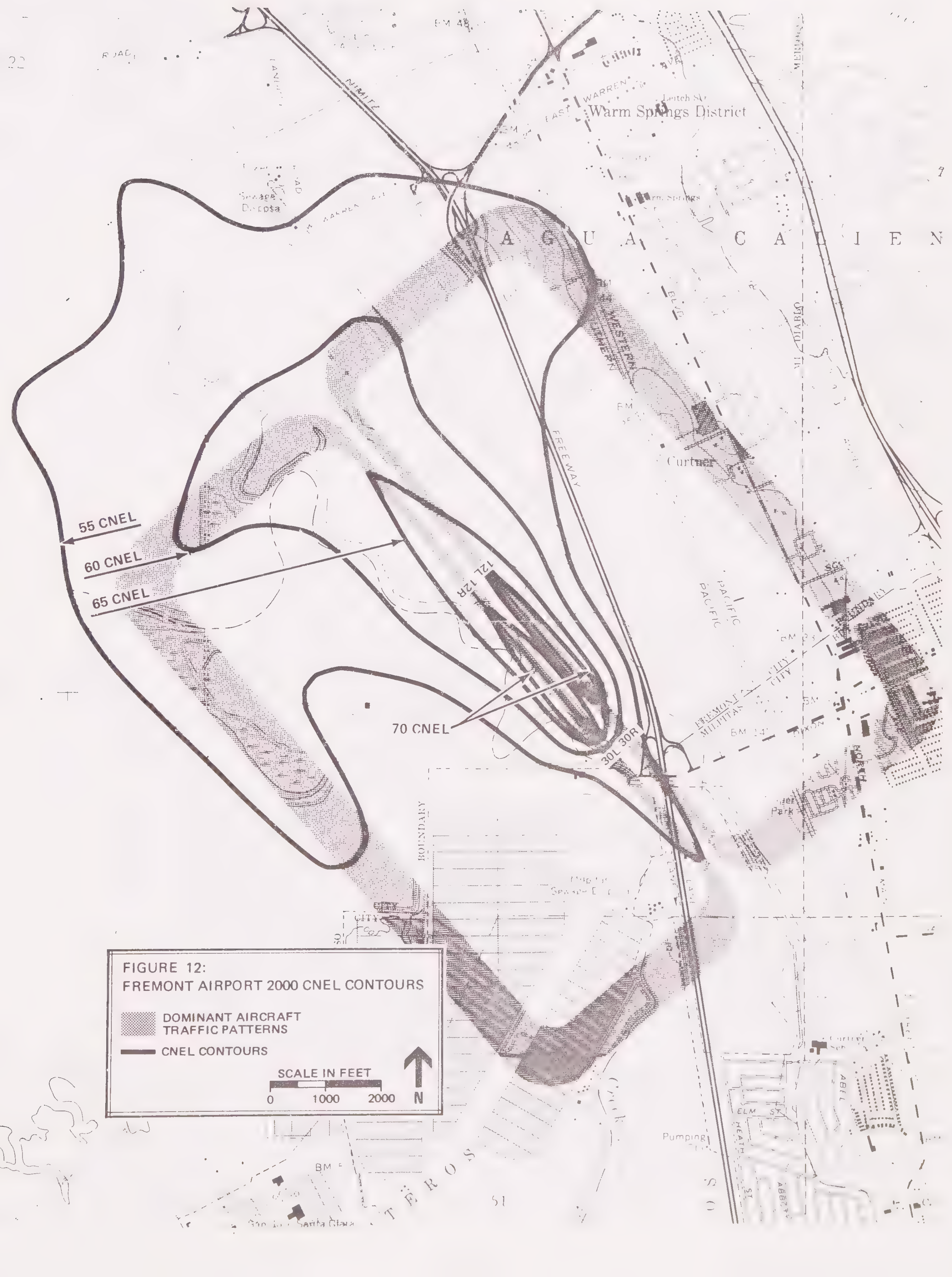


FIGURE 11:
FREMONT AIRPORT 1980 CNEL CONTOURS



Warm Springs District
A G U A C A L I E N
55 CNEL
60 CNEL
65 CNEL
70 CNEL
12L 12R
30L 30R
FREEWAY
PACIFIC
BOUNDARY
FIGURE 12:
FREMONT AIRPORT 2000 CNEL CONTOURS
DOMINANT AIRCRAFT TRAFFIC PATTERNS
CNEL CONTOURS
SCALE IN FEET
0
1000
2000
N

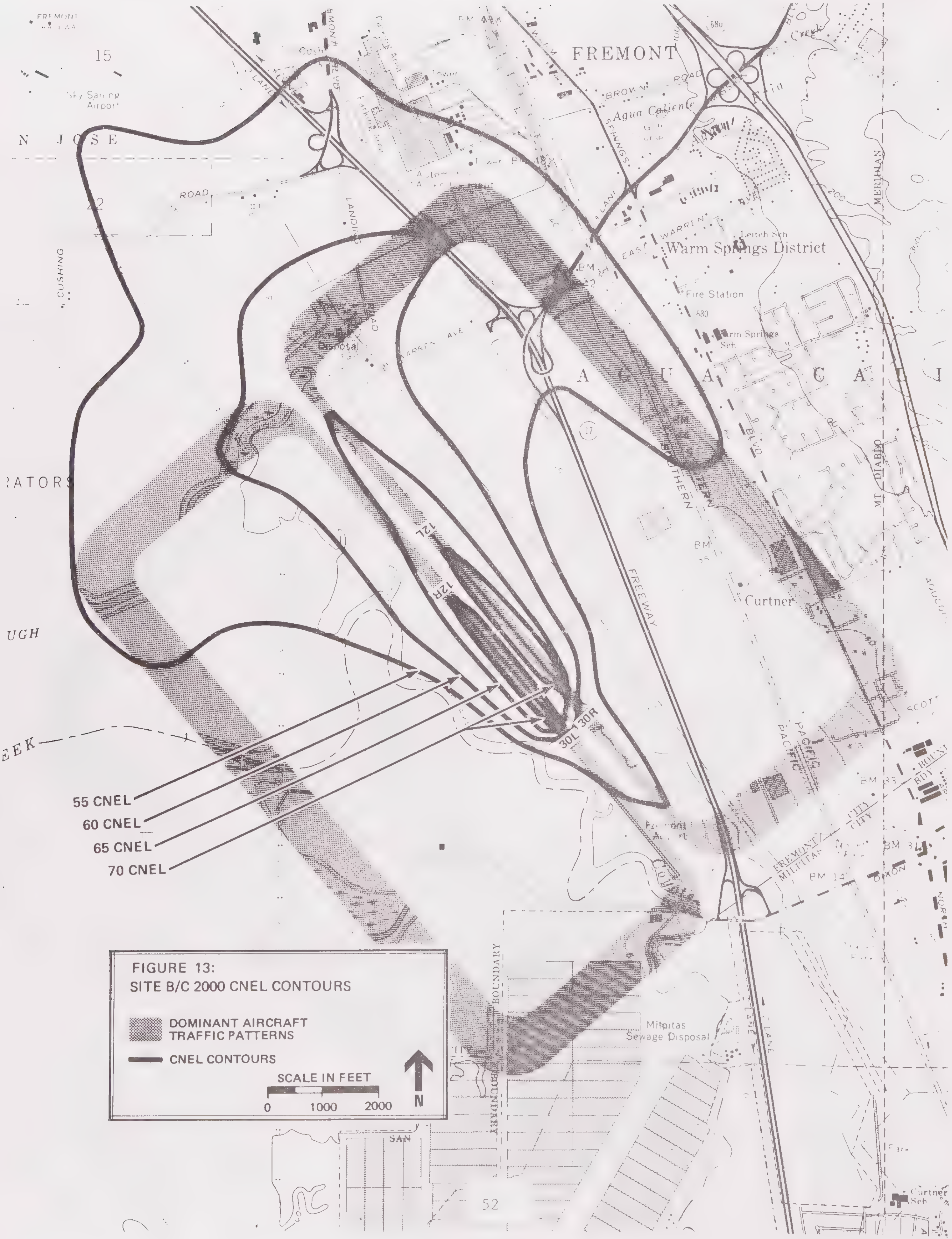


FIGURE 13:
SITE B/C 2000 CNEL CONTOURS

east of the Nimitz. Similarly, noise associated with general aviation use of Moffett Field would not increase the ambient noise level inasmuch as adjacent industrial uses, existing military aircraft noise, and highway/freeway noises would virtually "absorb" any noise level associated with general aviation activity.

In terms of inducing growth, there clearly exist situations in which an airport provides a growth stimulus to an area. In this instance, however, there is a recognized shortfall in the supply of aviation facilities in the South Bay. The Metropolitan Transportation Commission has focused attention on that shortfall, as has Santa Clara County in undertaking an update to its County aviation master plan. Thus, the new general aviation facility, as discussed in this study, represents a response to existing demand and anticipates future demand. Population growth and economic development in the South Bay result from a variety of factors that are not dependent on the presence of a new general aviation facility. In fact, development is occurring so rapidly in this portion of the region that unless a new general aviation site is designated soon, land currently suitable for airport use may be converted to other uses.

ENGINEERING FACTORS

Topography and Drainage. Earthmoving requirements for runway construction are directly related to the degree of slope at the site. Also, slope at the site affects drainage. Topographic and drainage features at the existing Fremont Airport and Site B/C are quite similar since both sites are located in close proximity to one another. Proper development at either site would require earth fill and development of adequate drainage systems to minimize flooding, although more extensive work would be required at the existing airport since its elevation is lower than Site B/C. Development at Moffett Field would require minimal extension of drainage systems and would be a relatively minor consideration when compared to the two Fremont area sites.

Soil. Soil characteristics affect the construction costs of airfields, roadways, and buildings. While the soil types present at each of the three sites are relatively similar, the Moffett Field development would have comparatively fewer problems since the development area is farther inland and drainage problems are comparatively quite minor. The soils at both Fremont area sites would require special consideration during engineering to assure suitable development.

Utilities. Due to the significant development of Moffett Field and its environs, the extension of utilities would be a relatively minor consideration. Currently, adequate facilities exist at the existing Fremont Airport although significant expansion would be necessary for development of a larger public general aviation facility. No utilities exist at Site B/C; however if developed as an airport, surrounding properties would be developed industrially and therefore adequate utilities would be relatively available. Utility costs are expected to be the lowest at both existing airports since utilities currently exist. Development at Site B/C would require additional utilities and therefore greater cost although it is recognized that surrounding properties would be developed industrially thereby benefiting either of the Fremont sites.

Relocation. Because of the amount of land required, airport development often necessitates some relocation or removal of structures and roads within the airport proper. Development at Moffett Field would not require any special relocation of structures or facilities since the area to be developed is the currently-vacant portion of the air station. Construction at the existing Fremont site would require relocation and reconstruction of several facilities, however that would be expected for further significant development as a public airport meeting FAA standards. Little or no relocation would be required for Site B/C since it is currently vacant. It is important to note that if Site B/C were developed, it would require closure and relocation of activities and facilities at the existing Fremont Airport. Moffett Field is expected to have the least relocation costs since the area to be occupied is relatively vacant. Increased development at the existing Fremont Airport would not result in significant relocation costs since it is expected that the existing businesses would continue at the new airport. Development of Site B/C would not have any particular on-site relocation costs. However development of this site would require closure of the existing Fremont Airport and therefore, relocation costs for those businesses and activities.

Land Values. Because the existing Fremont Airport and Site B/C are immediately adjacent to one another, it is assumed that land costs would be similar. While raw land costs may be less at the existing airport site because of its lower elevation and flooding susceptibility, expenditures to fill and elevate the site would result in comparable overall land costs. But it is also realized that there are additional costs for acquiring existing facilities at the Fremont Airport as compared to vacant Site B/C. In terms of land acquisition, Moffett Field is considered least costly since it is assumed that the public agencies responsible for civil airport facility development would occupy the land at little or no cost. This would of course be subject to negotiation with the United States Navy.

Site Development. Development costs would be least at Moffett Field since all airfield facilities have already been constructed and merely terminal area development would be required. Development costs at the existing Fremont Airport or Site B/C are relatively similar in that all new facilities meeting FAA standards would be constructed. There would be some savings at the existing Fremont Airport since portions of the existing facilities would be usable during early stages of development.

RECOMMENDATION

Based on the foregoing, it is apparent that there are numerous similarities as well as some significant differences among the three sites under consideration. Three charts have been provided which summarize the relative advantages, disadvantages, and neutral aspects of some of the key site comparison criteria.

The qualitative comparison of the natural and social environment indicates few differences among the three sites. It is true that construction on Site B/C would disrupt the existing use of the site, however any development here would have this impact. Probably more

significant is that development of an airport at Site B/C would likely result in use of a portion of the existing marshland which lies on the west side of the site. While the actual extent of impact could not be known until the engineering design stages of the development plan, it appears that there would be some interference with the fish and wildlife ecology of this area. Depending on how the existing Fremont Airport site is developed, there may be some facilities proposed on the southernmost portion of the marsh area and, therefore, environmental consequences to be considered. Some impacts on wildlife breeding, nesting, or feeding grounds could result from development at any of the sites since aircraft would be flying over marshland and portions of the San Francisco Bay National Wildlife Refuge Complex.

The chart of the overall qualitative comparison of site alternatives summarizes the discussions of this section. It is intended to provide a broad indication of development feasibility at each of the three sites and, while scoring on specific factors is not weighted for degree of importance, some clear implications emerge from a review of the entire chart. It is clear, for example, that from a civil aviation viewpoint, the best development alternative would be Moffett Field NAS in terms of operational capabilities, engineering factors, and anticipated cost. The most feasible alternative in the Fremont area would be expansion of the existing Fremont Airport.

Based on review of Bay Area aviation forecasts, it is recognized that general aviation demand could be met through development of joint use at Moffett Field as well as a new Fremont Airport, in addition to other South Bay airport development programs. Due to increasing development pressures in the Fremont area, it is recommended that initial efforts be concentrated on the expansion of the existing Fremont Airport, with further study, discussion, and identification of alternatives regarding potential local agency agreement with the United States Navy for some degree of joint use at Moffett Field Naval Air Station.

Between March and June 1981, public meetings were held in Fremont, Milpitas and Sunnyvale to discuss alternative airport locations and to solicit public comments. In addition, presentations were made to the San Jose Airport Commission, the study's technical advisory committee, and the FAA. At the conclusion of these reviews, the study sponsors chose to focus further General Aviation Reliever Airport planning work on the existing Fremont Airport site. This decision resulted from an evaluation of the criteria included in this report and public meeting comments. Factors given particular emphasis in the identification of the Fremont Airport site included the availability of the site, the expectation that a high level of off-airport compatibility could be achieved through facility design, and that use of the existing Fremont Airport minimized impacts on the natural environment.

TABLE 9
QUALITATIVE EVALUATION OF IMPACTS ON THE NATURAL ENVIRONMENT

	Existing Fremont	Moffett N.A.S.	Site B/C
Degrade Recreational Areas	0	0	0
Alter Species Behavior Patterns	0	0	–
Interfere w/Wildlife Breeding, Nesting, or Feeding Grounds	?	?	–
Increase Air/Water Pollution	–	–	–
Adverse Impacts on Water Table	0	0	0

TABLE 10
QUALITATIVE EVALUATION OF IMPACTS ON THE SOCIAL ENVIRONMENT

	Existing Fremont	Moffett N.A.S.	Site B/C
Create Noise Impact for People	0	0	0
Displace People/Businesses	+	0	–
Negative Aesthetic/Visual Impact	0	0	0
Disruption of Established Uses	0	0	–
Growth Inducement	0	0	0

TABLE 11
QUALITATIVE COMPARISON OF SITE ALTERNATIVES

	Existing Fremont	Moffett N.A.S.	Site B/C
Airspace	+	+	0
Obstructions	0	+	0
Wind	0	0	0
Visibility	0	0	0
Accessibility	0	0	0
Topography	–	+	–
Drainage	–	+	–
Soils	–	+	–
Utilities	+	+	–
Land Costs	0	+	0
Relocation Costs	+	+	0
Utility Costs	+	+	–
Use of Existing Facilities	+	+	–

Key: + Advantage – Disadvantage
0 Neutral/No effect ? Uncertain

Note: All Factors are not equally important.

Source: Wadell Engineering Corporation

AIRPORT PLANS

5. AIRPORT PLANS

The airport plans for the new Fremont Airport consist of the Airport Layout Plan (ALP) presenting a recommended 20-year schematic for development, and the Approach and Clear Zone Plan (ACZP) which presents information on airspace and obstruction conditions near the airport. The airport plans were prepared after evaluation of the aviation activity forecasts, the facility requirements analysis, and after identification of the site.

AIRPORT LAYOUT PLAN

The ALP represents the end result of considering various alternative configurations of facilities, particularly regarding establishment of navaids, location and alignment of T-hangars, aircraft parking aprons, and construction of the runway and taxiway system. Incorporated on the ALP are the recommended development items for the three major airport components: airfield, aircraft terminal area, and access and parking system. Subsequent chapters discuss the stage development program for these airport improvements, as well as their cost and the economic/financial impacts of undertaking their development.

The specific objectives of the ALP are to provide:

- o A safe airfield system with adequate runway length, strength, and clearances for basic utility stage II aircraft use.
- o Terminal facilities for general aviation aircraft, pilots and passengers with adequate and convenient aircraft basing area, buildings, auto parking and access.
- o A flexible development plan with space and use relationships that will enhance service and provide user and community benefits.
- o An economical plan that will provide suitable facilities and generate revenues necessary for proper operation, management and development of the airport.

<u>Airfield:</u> The airfield system includes the runway, taxiways, lighting, on-airport navaids, and the clear zones.

The proposed runway system is comprised of 3,000′, a basic utility stage II runway on the same alignment of the existing runway, and a short 2,400′ basic utility stage I intersecting runway rotated about 20 degrees northeast of the existing runway. Both runways would be 75′ wide, and would be for visual approaches only.

This intersecting runway system was selected from several combinations and orientations of single, parallel and intersecting runway system alternatives in order to minimize aircraft overflights over residential areas. The selected system is situated to clear the P.G.E. transmission lines to the northeast, as well as provide for all traffic patterns to the west side of the runways. Runway 15-33 has an extended approach path

remaining west of the Nimitz Freeway through the Milpitas area, and would be used predominantly for touch and go traffic and arriving traffic. Runway 13-31, the longest runway, would be used for all departing aircraft.

Although wind data is not available for the site, review of other area airports would indicate an annual traffic flow to the northwest 90%, and to the southeast 10%.

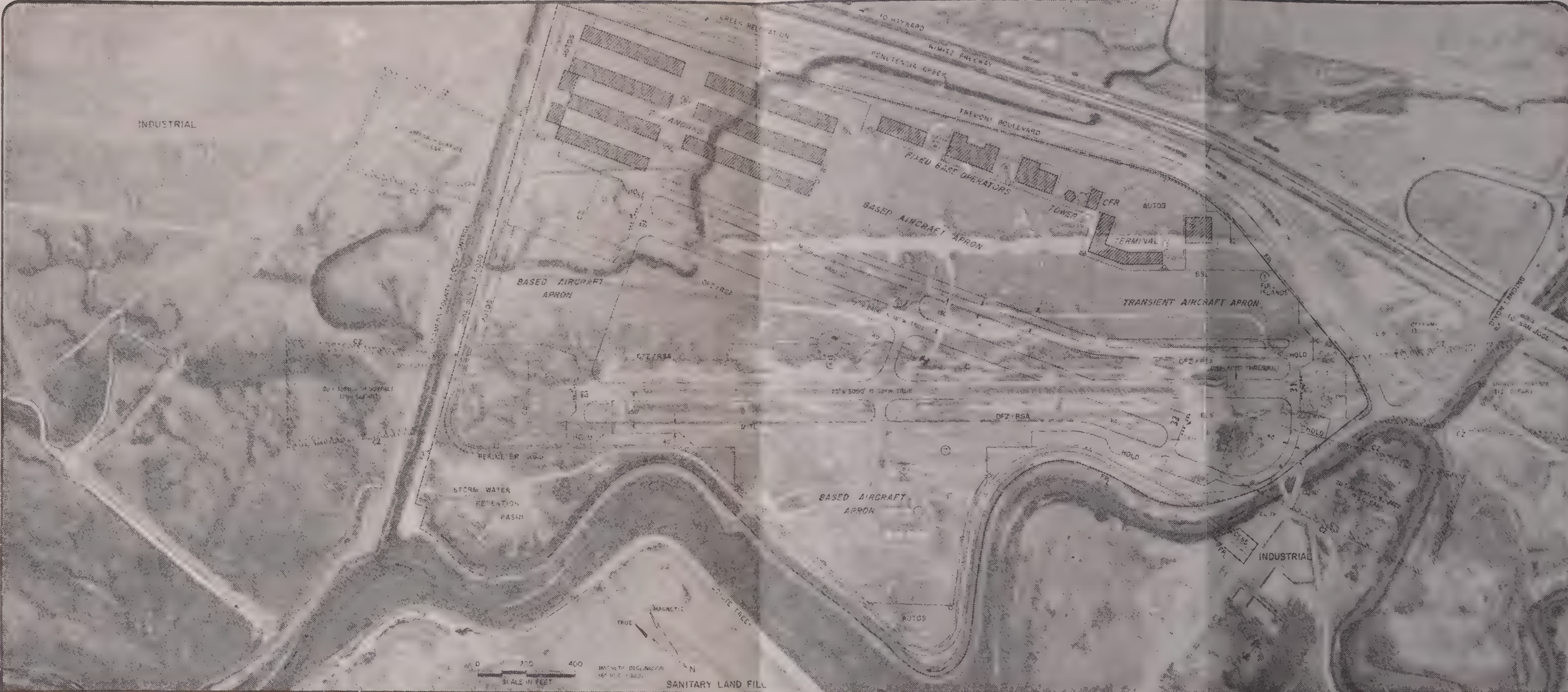
The proposed taxiway system consists generally of parallel taxiways on both sides of the runways. This taxiway system is 40 feet wide and extends the length of the runways. Runway exits are proposed at each runway end and various midfield locations . The 40-foot width is adequate for all basic utility aircraft.

Holding aprons constructed at both ends of the runways will provide an area clear of taxiway traffic for aircraft to park while the "before-takeoff-check" is performed. The construction of holding aprons will minimize delays to departing aircraft by providing bypass capability. Taxiway edge lighting, signs, and markers are recommended to improve nighttime guidance of aircraft. Visual approach slope indicators (VASI) are proposed for Runway 15-33 runway ends for improved visual approach capabilities. The VASI enables pilots to make accurate approaches with safe obstruction clearance and reduced aircraft noise around the airport due to established approach slopes. The downwind VASI boxes are to be located 200 feet from the thresholds. The separations between the boxes is 700 feet. All VASI should be on the left side of each runway and 50 feet from the pavement edge.

Other lighting aids which are recommended include medium intensity runway edge lights (MIRL) on both runways and runway end identifier lights (REIL) on runway 15-33 and a rotating beacon. The siting of all approach and lighting aids is representative only and subject to FAA review and design.

Runway setback requirements are also indicated on the ALP. For the new Fremont Airport, the obstacle-free zone (OFZ) is 250 feet wide and centered on each runway. In this area, no object may penetrate the volume of space above this zone except for necessary lighting and frangible-mounted navaids. The building restriction line (BRL) is 200 feet each side of the runway centerline. The BRL defines the closest point to the runway that any building may be constructed. In practice, a building's height must also be considered before siting its location and the requirements of FAR Part 77 satisfied regarding obstructions to navigable airspace. Suitable building locations are behind the building setback line (BSL) shown in the terminal area.

The ALP also indicates approach surface slopes and clear zone dimensions. The approaches to all runway ends are proposed to be visual, as differentiated from non-precision or precision. The approach surfaces will be sloped at 20 horizontal to 1 vertical for a distance of 5,000 feet. Each clear zone encompasses an area which begins 200 feet from the end of the primary surface, and extends to a point where the approach surface reaches a height of 50 feet above the end of the runway.



AIRPORT DATA

	FUTURE	
AIRPORT ELEVATION (M.S.L.)	5'	
AIRPORT REFERENCE POINT LAT	37°27'30"N	
LONG	121 55 39 W	
AIRPORT AND TERMINAL NAVAIDS	NONE	
CLASSIFICATION	B U II	
TAXIWAY MARKINGS	℄ SIGNS	
CRITICAL AIRCRAFT	C-310	
ANNUAL RUNWAY CAPACITY (Ops)	475 000	
HOURLY RUNWAY CAPACITY (Ops)	175	
TOTAL AREA (FEE TITLE)	141 ACRES	
(EASEMENT)	23 ACRES	
MEAN MAX TEMP OF HOTTEST MONTH	78 3°F	

RUNWAY DATA

	R/W 13-31	R/W 15-33
PHYSICAL LENGTH (WIDTH)	3000' (75')	2400' (75')
EFFECTIVE GRADIENT %	0.00	0.00
PAVEMENT STRENGTH	8000 lbs SINGLE	8000 lbs SINGLE
MARKING	BASIC	BASIC
LIGHTING	MIRL	MIRL/VASI
INSTRUMENT RUNWAY	NO	NO
APPROACH SURFACE FAR 77	20 1/20 1	20 1/20 1
ACTUAL CLEAR	20 1/13 1*	21 1/17 1*
NAVIGATIONAL AIDS	NONE	NONE
CLEAR ZONE DIM. INNER	250	250'
OUTER	450	450
LENGTH	1000	1000

*Close in road obstruction

LEGEND

	FUTURE	
		AIRPORT REFERENCE POINT
	— PL —	AIRPORT PROPERTY LINE
		OBSTRUCTION (See sheet 2)
	CZ	CLEAR ZONES
	BSL	BUILDING SETBACK LINE
	OFZ RSA	OBSTACLE FREE ZONE/ RW SAFETY AREA
		FACILITIES
	xx	FENCE LINE
		AVIGATION EASEMENT
		DRAINAGE
		GROUND CONTOURS
		FLOODLIGHTS

FACILITIES

1	TOWER / CRASH FIRE RESCUE
2	TERMINAL
3	FUEL ISLANDS / STORAGE
4	FIXED BASE OPERATORS
5	T HANGARS
6	SEGMENTED CIRCLE/ LIGHTED CONE
7	EXISTING APRON
8	EXISTING BUILDINGS
9	EXISTING HANGARS
10	
11	
12	
13	
14	
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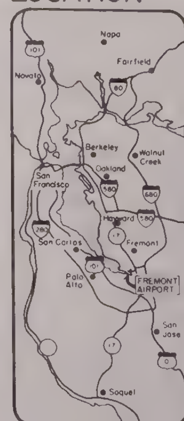
20	

LOCATION



NOTES:

- DETAILED TOPOGRAPHIC MAPPING IS NOT AVAILABLE. ELEVATIONS SHOWN ARE ESTIMATES.
- ALL PROPOSED AIRFIELD PAVEMENTS ARE ASPHALTIC CONCRETE.
- THE AIRFIELD AREA IS SUBJECT TO FLOODING. TERMINAL AREA BUILDINGS STRADDLE THE 100 YEAR FLOOD ZONE BOUNDARY.
- LAYOUT OF RUNWAYS AND OTHER FACILITIES ARE SUBJECT TO MAPPING, DESIGN, AND FAA REVIEW.
- SEE APPROACH AND CLEAR ZONE PLAN AND SITE FEASIBILITY TEXT FOR ADDITIONAL DETAILS, DISCUSSION, AND COMMENTS.
- PROVIDE STABILIZED SAFETY OVERRUNS AT EACH RUNWAY END
- DISPLACE THRESHOLD 31 FOR 20:1 ROADWAY CLEARANCE.
- OBSTRUCTION LIGHT POWER TRANSMISSION TOWERS AND STREET LIGHT STANDARDS.

approval

NO	DATE	BY	REVISIONS
DRAWN CMM	CHECKED	DESIGNED RPW	

FREMONT AIRPORT

A GENERAL AVIATION RELIEVER AIRPORT

FREMONT CALIFORNIA

AIRPORT LAYOUT PLAN

SHEET 1 / 2 SHEETS

SCALE AS SHOWN

B NUMBER 1065 | DRAWING NUMBER 1065-1 | DATE 8-82

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The Airport Layout Plan shows the future fencing program necessary for proper operations of the airport. The purpose of a properly prepared fencing program is to minimize hazards to pedestrians and ground vehicles by separating them from aircraft as a safety measure. Furthermore, fencing allows for better definition of airport property and areas under lease to airport tenants. The fencing as shown on the layout plan drawings generally reflects perimeter fencing of the airport property, but also identifies fencing necessary in the terminal areas to separate aeronautical from ground base activities. In addition, fencing should be provided to keep out non-airport activities unless a suitable lease agreement and ingress/egress permit is established.

A pavement strength of 8,000 pounds for single wheel configuration aircraft gross weights will be adequate for the basic utility runways. Soils data for pavement design is not available for the site. However, we may assume silty-clay soils with a CBR of four for planning purposes. In order to achieve 8,000# strength, an approximate pavement section of two inches of asphaltic concrete surface on three inches of base and 7 inches of subbase would be required. This strength will be desirable for all taxiways and aprons as well as for the runways.

The Stage Development and Cost Estimate chapter of this report presents the estimated cost to carry out the pavement construction program. Final design procedures during engineering for the paving projects will indicate exact requirements and may reveal some cost saving techniques and alternatives.

Drainage at the new Fremont Airport site generally flows to the west towards the San Francisco Bay. The existing slopes in the area are generally less than 0.5 percent. The relative impermeability of the soils causes most of the rainfall to be absorbed slowly, thus causing most of the water to run off. Because of these conditions, a drainage system consisting of collector ditches, with culverts under paved areas, should be developed to keep water from gathering in air operations areas.

The water flow is expected to be collected by a small internal diked channel on the airport property parallel to Coyote Creek. At the northwest corner of the site a retention basin with flap type flood gates and ejector pumps is proposed. Runoff from the airport terminal area should drain to an oil/grease separator basin prior to further discharge to the airport drainage system.

Terminal Area: The terminal area layout as depicted on the ALP was prepared after completion of the Forecast, Demand/Capacity Analysis and Facility Requirements section of this report. The plan was developed simultaneously with the airfield plan to assure workability within the total plan, as well as appropriate integration in the staging process. An effort was made to achieve balance between operating convenience and efficiency with facility cost.

The terminal area includes the aircraft parking aprons, T-hangar areas, FBO areas, terminal building, air traffic control tower and crash-fire-rescue building sites, fueling facilities, and other aviation-related

facilities and services. Some considerations in development of the terminal plan are:

- o Proximity of utilities
- o Auto access and circulation
- o Impacts on surrounding land uses
- o Operating efficiencies and safety
- o Development costs
- o Business viability
- o Passenger convenience and comfort
- o Aircraft operational requirements
- o Flexibility for future change

Future development of terminal buildings is concentrated on the east side of the runway system. This location allows for convenient access to terminal facilities as well as keeping structures and other major development away from the less desireable soil and drainage conditions on the west of the airport property.

The primary terminal facilities are conveniently located near the mid-field, allowing direct access to both the airport entrance road and the runway/taxiway system. Typically airport terminal facilities are oriented parallel to primary runway and taxiway systems, allowing for expansion of the terminal area in either direction. This configuration is possible at Fremont due to the parallel layout of the runway and future four lane Fremont Boulevard. The apron and fixed base operator expansion will continue to the north along the roadway. Such an orientation results in development allowing for ease of construction and extension of utilities and pavements as necessary. This also lends well to extension of storm and sanitary systems. Final layout of the terminal area is subject to detailed design studies with airport topographic mapping.

A site has been preserved for a terminal building. As noted in the Facilities Requirements section of this report, the need for this building is not immediate, since the lobbies of the FBO buildings should adequately serve all passengers initially. However, it is important to preserve a centralized location for a terminal for when such a facility is required.

A new fire-crash-rescue building is also proposed for the terminal area. Airports of this size do not normally require such a facility on-site. However, due to the distance from this site to the nearest firefighting equipment, located in Fremont, the response time to an emergency at the airport would be improved. In order to enhance safety at the site, a fully equipped facility would be desired. Any structural fire station to be located in the industrial park to the north might instead be on airport property and be jointly manned. Because the airport is not planned to be a certified air carrier facility, this development will not be eligible for FAA funding.

Various FBO sites are located on the drawings. These sites allow ample space for necessary buildings and auto parking. The location provides convenient access to the apron by aircraft and to the access road by autos.

The ALP designates a large area for T-hangar development in the north easterly portion of the terminal area. This area has capacity to satisfy the demand throughout the planning period.

Future apron area is shown for both based and transient aircraft. The airport parking layout provides for convenient and efficient aircraft flow both on the aprons and on the taxiways. The network of runway exits and connections to the apron area allows aircraft to enter both the based and transient parking areas with minimal delay. Transient aircraft parking is of the "power-in/power-out" type to provide convenient and efficient maneuvering of the aircraft. Based aircraft parking is "tail to tail" to allow optimum spacing commensurate with apron size and construction costs. Space is provided west of the runway area for based aircraft apron, as well as between the north westerly ends of the runway system.

Aircraft fueling equipment and underground fuel storage areas will be needed to serve the terminal area. The aircraft fuel island facility is located on the southeast apron. The fuel farm is located adjacent to Fremont Boulevard in order to keep highway tankers off the apron. The new underground terminal area storage tanks should be 10,000 gallons minimum per tank. About 100,000 gallons of storage is desirable.

Because the proposed site is outside the heavily developed parts of Fremont, all required utilities must be provided to the site before operation of an airport can begin. These utilities include water, sewer, electricity, and communications.

Water supply to the site is important for both domestic use and fire protection. A new water main must be extended to meet these requirements.

Sanitary sewage would be handled by new sewer mains to be constructed along Fremont Boulevard. A small pump station may be required due to the flat topography.

For electrical service, all distribution lines would be underground. Service would be extended along Fremont Boulevard.

<u>Access:</u> The ALP indicates the future airport roadway facilities as well as the surrounding highway system. Access to the airport site is via Fremont Boulevard, a four lane planned roadway, that connects with Dixon Landing Road to the south east. The Nimitz Freeway is parallel to the site providing excellent regional access.

Vehicle trip and auto parking spaces were calculated as part of the determination of access requirements, as discussed in the facility requirements section of this report. The results of that analysis are presented in Table 12.

TABLE 12
VEHICLE TRIPS AND AUTO PARKING SPACES

	1980	1985	1990	1995	2000
Daily Vehicle Trip Ends	180	3725	3950	4150	4300
Peak Hour Trips	35	420	445	465	480
Auto Parking Space Demand	120	650	695	725	755

Auto parking will be provided by the FBO's in connection with their lease agreements with the airport with terminal building auto parking constructed by the airport owner. These lots have convenient access to the terminal building and the aircraft parking apron as well as to the FBO buildings. Much of the auto parking for based aircraft owners may be scattered to the various apron and hangar spaces.

APPROACH AND CLEAR ZONE PLAN

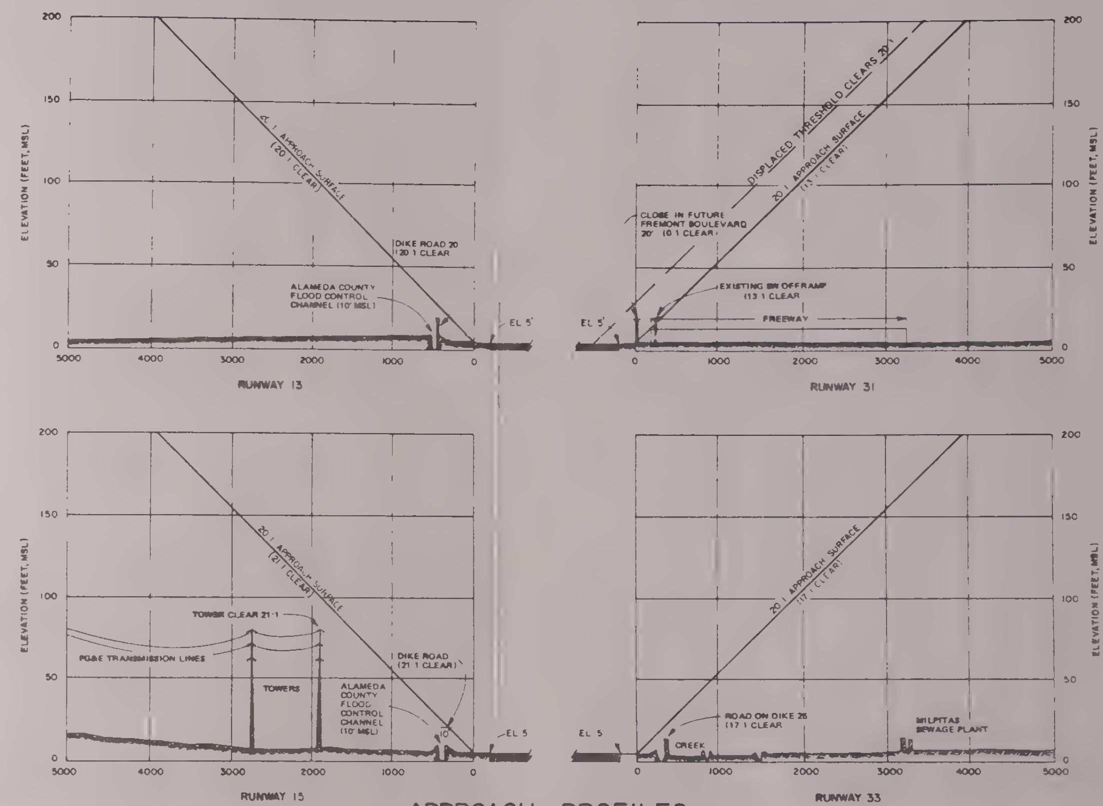
As part of the planning of airport facilities, an Approach and Clear Zone Plan (ACZP) was prepared for the new Fremont Airport. The ACZP supplements the Airport Layout Plan (ALP) and provides profile and plan view information for the runway approach areas. A key function of the ACZP is to identify obstructions in the vicinity of the airport which may have an impact on the use of the runways and adjacent airspace. The ACZP is prepared using criteria contained in Federal Aviation Regulations, Part 77, "Objects Affecting Navigable Airspace." At this airport, the FAR Part 77 dimensional standards applied are those relating to runways with visual approaches.

The plan provides for visual approaches to the all ends of the runways. These approaches are 5,000 feet long, sloped at 20 to 1 (horizontal to vertical). The approach surfaces flare from an inner width of 250 feet to an outer width of 1,250 feet. All approaches begin 200 feet beyond the runway threshold, at the threshold elevation.

The transitional surfaces are sloped at 7:1 until intercepting the horizontal surface. The horizontal surface is 150 feet above the airport elevation and extends 5,000 feet from the runway centerline and primary surface intersection. At the limit of the horizontal surface, a conical surface of slope 20:1 and a 4,000-foot width completes the required protection surfaces for this airport.

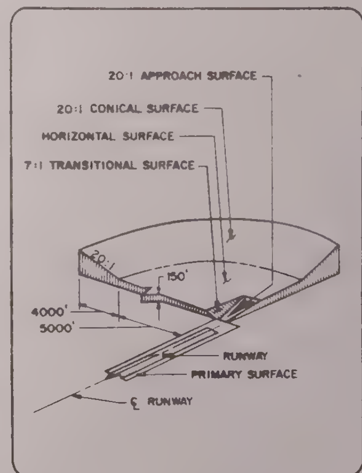
The airport elevation is assumed to be 5 feet mean sea level, which is the highest point on the runway system. A profile of the approach to each runway appears on the ACZP. The profile drawn is a composite of all terrain and objects in the approach area. There are no known penetrations in the future primary, approach, or transitional surfaces. Terrain penetrates the conical surfaces north east of the airport. However, these obstructions should not seriously affect the safety of the airport.

Upon construction of the new airport, a new height zoning ordinance will be required to be incorporated in City and County zoning.



APPROACH PROFILES

ISOMETRIC VIEW



SUMMARY OF APPROACH CRITERIA

RUNWAY NUMBERS	13-31	15-33
NAVAIDS		
TYPE	NONE	NONE
APPROACH SURFACE		
LENGTH	5000'	5000'
SLOPE	20:1	20:1
CLEAR ZONE		
INNER WIDTH	250'	250'
OUTER WIDTH	450'	450'
LENGTH	1000'	1000'
TYPE	VISUAL	VISUAL
RUNWAY LENGTH	3000'	2400'

NOTES:

- THIS PLAN IS TO PRESERVE AND PROTECT FOR INTERSECTING RUNWAYS 13-31 (3000' LONG) AND 15-33 (2400' LONG) WITH VISUAL APPROACHES
- THERE IS A NORTHEASTERLY TERRAIN PENETRATION OF THE CONICAL SURFACE. ROAD CLEARANCE PENETRATIONS ARE IN THE CLEAR ZONES FOR RUNWAYS 31 AND 33, AS SHOWN
- BASE MAP IS CURRENT U.S.G.S. SITE SPECIFIC TOPOGRAPHIC MAPPING IS NOT AVAILABLE.
- ALL RUNWAY ENDS/AIRPORT ELEVATION EXPECTED TO BE APPROXIMATELY 5' MSL. AIRPORT REFERENCE POINT COORDINATES ARE AS FOLLOWS: LATITUDE 37° 27' 30" N AND LONGITUDE 121° 55' 38" W.
- NO FAR PART 77 HEIGHT RESTRICTIVE ZONING IS IN EFFECT.
- OBSTRUCTION LIGHT POWER TRANSMISSION TOWERS.
- DISPLACE RUNWAY 31 THRESHOLD TO CLEAR 20:1.

approval

NO	DATE	BY	REVISIONS
DRAWN CMM	CHECKED	DESIGNED RPW	

FREMONT AIRPORT
A GENERAL AVIATION RELIEVER AIRPORT
FREMONT CALIFORNIA

APPROACH & CLEAR ZONE PLAN

JOB NUMBER 1065 | DRAWING NUMBER 1065-2

SHEET 2 / 2 SHEETS
SCALE AS SHOWN
DATE 8-82

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SITE ENGINEERING CONSIDERATIONS

Since this is a feasibility study, detailed field testing, mapping, and soils investigations of the existing Fremont Airport is not warranted, nor was it budgeted. These activities would take place in future studies, if there is sufficient interest in developing a new Fremont Airport. There is, however, a wealth of secondary information developed for the industrial park planned immediately northwest of the airport site. Due to numerous similarities between the two parcels, much of the information has been used to provide for engineering considerations of the new airport.

The airport site is located along the southeastern edge of San Francisco Bay, on diked former marshland. The open waters of San Francisco Bay are about five miles west of the site. The site is bounded on the west by Coyote Creek and on the north by an Alameda Flood Control District Channel. The channel flows into Coyote Creek at the northwestern corner of the property. Levees, baylands and salt evaporation ponds separate the site from San Francisco Bay. Portions of the baylands and salt ponds are inundated each year. The site is protected from tidal action by the levees along Coyote Creek. The levee is approximately eight feet high and was overtopped in the vicinity of the airport in 1977. The site was also flooded from rains and storm water drainage overflow in April 1982.

Drainage on the site is toward the west. The runoff generally flows overland; a few short channels direct the water. The water tends to flow to the inside of the levees and ponds there until it evaporates or infiltrates into the soil.

Hydrology and Drainage

Development of the airport would result in several changes in the hydrologic characteristics of the site. The proposed plan includes development which would be protected from flooding by construction of a new drainage system and construction of a retention basin. Development of the site would increase the amount of impervious surface and thus would increase the amount of runoff from the site.

The purpose of the proposed system is to provide drainage of the development, and to ensure that increased flows do not occur in Coyote Creek during storm periods or high tide periods. The drainage system would not reduce the amount of additional runoff from the site resulting from project implementation, but would control the rate at which the runoff leaves the site, so that flows can occur during non-peak periods and avoid adding to downstream flooding.

The drainage system would involve collection of runoff from the airport in a conventional piping system; the size of the system would be determined in coordination with the Alameda County Flood Control District during project design. The piping system would discharge the runoff into one retention basin. The basin would receive and store runoff from the development during storm periods. The water would be stored until the tide level outside the basin lowers to half-tide (about 0.0 feet NGVD) when the flapgates at the basin outfalls would open to drain the basins.

During the spring months the gates could be manually closed to retain the stormwater runoff for a longer period, creating freshwater ponds or marsh areas. When the water becomes stagnant the gates can be opened to drain the basins.

In order to ensure proper functioning of the drainage outfall system and continued protection by the levees, the system and levees must be consistently maintained.

If the retention basin on the site silts up, the capacity would be reduced and additional flooding on the site could be expected. The amount of flooding would depend on the actual capacity of the basin and on the size of the storm. Regular maintenance and dredging of the basins would reduce this possibility.

Water Quality

Project construction would involve grading on much of the site, exposing the soils to erosion. Because of the basically level topography of the site, however, erosion would be expected to increase by a negligible amount.

Stormwater collected on the site would probably be degraded by pollutants such as oil, grease, gasoline, and tire rubber from traffic on the airport and parking lots. Other pollutants, including fertilizers, herbicides and pesticides used on landscaping could be washed into the stormwater. Particulates (silt) would also be found in the runoff from the site.

Once the runoff water reaches the retention basin, some of the particulates and other pollutants would probably settle out, causing some pollution in the basin and resulting in accelerated sedimentation. It is likely that maintenance dredging of the basin would be periodically necessary.

Geology and Soils

The City of Fremont overlies a deep bedrock trough, which rises to form the steep hills in the eastern part of the City and Coyote Hills near the edge of San Francisco Bay. The trough has been filled with alluvial material deposited by streams flowing from the hills and with Bay mud and other sediments. This material is 400 to 600 feet thick in some areas. The Bay plain is crossed by meandering streams which flow into the Bay and which have deposited gravel and silt in the site area.

The site is generally level, sloping slightly downward to the west toward San Francisco Bay. The elevation of the site varies from a few feet above sea level at the western boundary to about 10 feet NGVD at the eastern boundary.

The surface soils just north of the site generally consist of firm to very stiff silty and sandy clays which extend 11 to 22 feet beneath the

ground surface. Five feet of fill overlying highly compressible Bay mud, 2-1/2 to 6 feet thick, was found on the western part of the airport site.

Beneath the clay, medium-dense to dense sands and silty sands are found; these sediments vary in thickness from 2-1/2 to 22-1/2 feet. Underlying these are very stiff silty and sandy clays, which extend to 50 feet below the ground surface, the maximum depth explored in the proposed industrial area north of the airport site.

Development of the site would involve grading to prepare the airfield, the road system and building sites, and excavation for the retention basin. Some import and export of material could be necessary if some of the material cut from the site were not suitable for reuse as fill. Material removed from the site for fill would have to be reworked and compacted before it could be used as fill.

Pavement and foundation design for the airport has not been accomplished. The industrial geotechnical report has indicated that one and two story structures can be founded on typical spread-footing foundations with footing depths between 18 and 30 inches and with non-expansive material underlying interior slabs in thickness between eight and sixteen inches.

A potential constraint to construction on the site would be the expansivity of the soils. Clay soils, such as those found on the site, tend to expand when wetted and shrink when dried. The changes in soil volume could cause cracks or other damage to foundations and structures built directly over the soil. Generally, the potential impact of expansive soils can be mitigated through proper design and construction of the project.

Clay soils can compact when structural loads are placed on them, resulting in settling of the soil and ultimately in differential levels underlying a structure. The soils on the site are highly consolidated, which could result in long-term settlement of less than four inches for fills up to eight feet thick. The expected differential settlement for one and two story structures would be less than 1/2 inch.

High groundwater levels on the site affect the construction of utility lines and other subsurface work. The excavations for subsurface work could encounter unstable or wet conditions.

<u>Seismicity</u>

Fremont is located in the seismically active San Francisco Bay area. Three major active faults have the potential to cause damage in Fremont. The San Andreas Fault, which is the largest fault in California and has caused a number of major earthquakes in the state, is located approximately 17 miles southwest of the site. The 1906 San Francisco earthquake originated on the San Andreas Fault and had a magnitude of about 8.3 on the Richter Scale. The 1906 quake caused great damage in San Francisco and the Bay Area, including Fremont.

The Hayward Fault, which parallels the San Andreas, passes about two miles northeast of the site. In the 1800′s two large-scale earthquakes

occurred on the Hayward Fault, causing considerable damage in the Fremont area, particularly to brick and adobe structures. In 1933, a large earthquake centered near the mouth of Niles Canyon knocked down chimneys in the area and caused rock falls.

The Calaveras Fault is about six miles northeast of the site. The largest historic earthquake on this fault had a magnitude of 6 on the Richter Scale.

Two other faults pass near the project site: the Mission Fault, suspected to traverse Mission San Jose and Niles east of Mission Boulevard; and the Silver Creek Fault, which is immediately east of the Coyote Hills. No earthquake activity has been recorded along either of these faults.

Liquefaction is the transformation of granular, water-saturated sediments into a liquid, flowing state similar to the transformation of sand into quicksand. Some of the sandy soils on the site are potentially liquefiable.

Lateral spreading and slumping may be induced by earthquake shaking in areas underlain by soft soils bounded by sloping surfaces, such as sloughs and canals. Areas on the site most likely to be subject to slumping are the sloping surfaces along the canals, drainage ditches, shorelines, levees and construction excavations.

Lurch cracking is the development of irregular fractures, crack and fissures which often accompany earthquake-induced groundshaking. Sand boils and mud volcanoes often accompany lurch cracking as ground water moves to the surface. Lurch cracking could occur on the site.

Tsunami are seismically induced sea waves generated by submarine earthquakes or landslides. Tsunami entering the Golden Gate are attenuated as they travel through the Bay.

A major earthquake with Richter magnitude of 7 or more is expected to occur along one of the major faults in the Bay Area every 60 to 100 years, so that a major seismic event can be expected to occur anytime, particularly along the Hayward and San Andreas Faults. The Calaveras Fault is considered less active than the other two faults.

The major seismic hazard for the site would result from the maximum credible event on either the San Andreas or Hayward Faults. The Hayward Fault is the nearest earthquake-producing fault and represents the greatest hazard by its proximity, although the San Andreas Fault could produce a larger earthquake.

Groundshaking at the site would be strong during a major earthquake and could cause damage to structures, resulting in cracks or breaks in earthquake-resistant buildings and serious damage to other structures. Pipelines, utility lines and electrical lines could crack or break, increasing health and safety hazards.

Liquefaction could occur in some of the soils on the site. According to the geotechnical report for the industrial development, this liquefaction would not cause significant damage to the industrial development because of the stiff, clayey soils overlying the sand layer, the density of the sand layer, and the fact that the site has been subject to strong groundshaking in the past that has increased its resistance to future liquefaction.

Although there have not been detailed field tests of the airport site, it is expected that many of the engineering considerations would be quite similar to those of the new industrial park.

6. LAND USE

INTRODUCTION

The attention of the airport operator is most often focused on facility development and financial affairs. Yet one of the most important aspects of airport planning is the assurance of compatible on and off airport land uses. Compatibility problems exist around airports throughout the United States and the resulting conflicts are becoming almost commonplace. These conflicts represent a serious confrontation between two important characteristics of urban life and economics: the requirement for an airport that meets transportation needs and the continuing demand for urban expansion in a manner that protects airport neighbors from excessive noise.

More and more, airport owners are finding that necessary expansion is difficult, expensive, and sometimes impossible at any cost. As new residential and noise sensitive uses move closer to airports, there is a continual potential for conflict. For people living in the vicinity of airports, aircraft noise is a threat to their quality of life. To them, the airport seems to be ever expanding with more and more aircraft operations every year. Often there are also other conflicts involving the protection of approaches to runways and the location of persons and property on the ground. These conflicts may be reduced, however, through the development and implementation of appropriate noise and land use compatibility plans.

The Airport and Airway Development Act encourages compatible land use in the vicinity of airports and provides funding for both addressing land use problems and for acquiring land under the FAA's Planning Grant Program and Airport Development Aid Program. A condition of receiving federal grants for such purposes requires an airport sponsor to assure that:

- The aerial approaches to the airport will be adequately cleared and protected by removing, lowering, relocating, marking, or otherwise mitigating existing airport hazards;

- Appropriate action, including the adoption of zoning laws, has been or will be taken, to the extent reasonable, to restrict the airport to activities and purposes compatible with normal airport operations, including landing and takeoff of aircraft.

The FAA as well as a number of other federal agencies have also published policies or guidelines dealing specifically with issues of noise and land use. This has been done for several different reasons: to carry out public law mandates to protect the public health and welfare and provide for environmental enhancement; to serve as the basis for grant approvals; and to integrate the consideration of noise into the overall comprehensive planning and interagency/intergovernmental coordination process.

LOCAL SETTING AND CLIMATE

Fremont Airport is located in the southwesternmost portion of the City of Fremont in Alameda County, California. The site lies approximately 9 miles from central San Jose, 7 miles from central Fremont, and 35 miles from San Francisco. The airport site is a diked area with an average elevation of approximately 4 feet Mean Sea Level (MSL). The triangular-shaped land occupied by the airport is effectively bound by San Francisco Bay and Coyote Creek on the southwest, the Alameda County flood control channel on the north, and the Nimitz Freeway on the east. While the site lies wholly within the incorporated City of Fremont, it abuts Santa Clara County and the City of Milpitas on the south and southeast.

The Nimitz Freeway lies immediately east of the airport site and connects directly to San Jose to the south and Oakland to the north. The Dixon Landing Road Interchange on the Nimitz provides direct access to the airport by a two lane paved road.

Meteorology at the Fremont Airport site is dominated by the Pacific Ocean and San Francisco Bay. The prevailing wind direction in Fremont is from the northwest and occurs approximately 53 percent of the time. Southeast winds occur approximately 11 percent of the time and all other directions occur approximately 12 percent of the time. Light-variable (calm) conditions occur approximately 24 percent of the time. The annual mean temperature in the area is $57^{O}F$, with the lowest temperatures typically occurring in January and the highest in July. The National Oceanic and Atmospheric Administration Weather Station in Newark shows average annual precipitation at 15 inches, with January the wettest month with an average 3.3 inches and July the driest with .02 inches precipitation.

EXISTING CONDITIONS

As noted in an earlier section of this report, land to the north of the airport, while currently in an open undeveloped use, has been the subject of several industrial development park plans. Land east of the airport beyond the Nimitz Freeway is a mixture of predominately agricultural and some industrial uses. Land to the southwest is in use as a landfill and, within the City of San Jose, is devoted primarily to the San Jose/Santa Clara Water Pollution Control Plant sludge ponds. To the southeast of the airport is the City of Milpitas where land is in an abandoned golf course or other open space use. The airport site is currently zoned in the A-F agricultural flood plain district which permits airports and landing strips as conditional uses.

It is important to note that the general plans of the City of Fremont, San Jose, and Milpitas all show land uses within a mile of the airport which are typically compatible with a general aviation facility (industrial use, public/quasi-public uses); zoning generally tends to support these uses. Nonetheless, it should also be acknowledged that the City of Milpitas is considering mixed use development (commercial, industrial, and residential) in areas where the general plan calls for industrial uses. The effect of this would be to bring residential uses closer to the airport site.

Given the considerable aviation activity within the San Francisco Bay area, there are several aviation planning interests which must be considered in the development of any new airport site. At the local level, the general plan in the City of Fremont has designated airport use at the current Fremont Airport site. There are not, however, any detailed policies within the City's plan which directly relate to the encouragement and support of aviation in the City in general or at that site in specific.

Some aviation planning occurs at the County level through the Alameda County Airport Land Use Commission (ALUC). The ALUC was established under state law to coordinate new development in the vicinity of public use and military airports and to make recommendations which, by promoting the compatibility of new development with existing and planned airport operations, would protect the welfare both of nearby inhabitants and the general public. The "Alameda County Airport Land Use Policy Plan" was adopted by the Alameda County ALUC in 1979. The policy plan establishes a "referral area" for the proposed new Fremont Airport and provide guidelines for reviewing projects within that referral area to determine if they are compatible with current and anticipated airport operations. The adopted referral area is approximately 750 acres and was defined based on a developer's concept that involved moving the airport from its present location to the foot of West Warren Avenue in the wetlands adjacent to Coyote Creek.

The principal concern of the Commission is with impacts of normal airport activities which could adversely affect adjacent areas and with uses or activities near the airport which might interfere with airport operations. Most significant of these impacts are noise - particularly from jet engines - and crash hazards. While ALUC policies regarding land use compatibility within the referral area are comparable to those which are portrayed in the "safety environment" discussion in a later section of this report, it should be noted that prior to final action by a public agency on a project within the referral area, ALUC staff must examine the project and evaluate its conformity with policy plan guidelines. Only projects which may be incompatible with the airport, as defined in the policy plan, need be referred to the Commission.

At the regional level, the Metropolitan Transportation Commission (MTC) maintains a Regional Airport Planning Committee. A working paper prepared by MTC in October of 1980, South Bay Airport Alternatives, contained both observations and alternatives for accommodating the general aviation demand within the South Bay. The documents noted in part that:

> Recent MTC surveys confirm that the role of general aviation is changing to provide a larger transportation function for business and individuals. In areas where economic growth is high, such as the Santa Clara Valley, the need for improved aviation facilities will be substantial. At the same time, regional policies also

reflect a concern for the growing number of aircraft in the crowded airspace in the South Bay...The need to limit general aviation training activity at San Jose Airport, because of its air carrier role, is perceived to be of paramount importance in the regional plan.

The Regional Airport Plan developed by MTC and the Association of Bay Area Governments (ABAG) in April of 1980 proposes possible acquisition of the existing Fremont Airport by a public entity in order to upgrade the facility so that it could accommodate almost 425,000 annual general aviation operations in the next 10-20 years.

BACKGROUND TO PLANNING

Of the many land uses which conflict with an airport environment, some have a pronounced tendency to locate near airports. In the long run the close proximity of incompatible uses can be disastrous.

First, many forms of urban development dangerously interfere with aircraft taking off and landing. Airspace obstructions such as buildings and transmission lines can significantly decrease airport safety and capacity. Electrical interference can restrict the use of communications and navigation equipment. Offsite lighting can make it difficult for pilots to distinguish between airport lights and others. Developments such as garbage dumps, sewage lagoons, and certain vegetation which attract birds, can create bird-strike hazards. In addition, smoke, odors, and intensive noise each have separate and negative impacts on airport operations. The accumulation of these and other factors can reduce and sometimes cancel the usefulness of an airport.

Since an airport can attract a variety of land uses, planning for the airport environment attempts to encourage activities best able to take advantage of a location near an airport. This involves two approaches: (1) the prohibition of uses negatively related to the airport, and (2) the encouragement of uses benefited by an airport location. Those uses most attracted to the airport are generally those least bothered by noise and other annoyances. The presence of these attracted uses acts as a buffer to uses which are negatively affected. Compatible land uses near airports typically have one or more of the following characteristics: they are (1) land uses involving few people, such as natural or open areas, (2) uses which are noisy, such as industries, (3) indoor uses, especially commercial and industrial use, which can be protected from noise by sound reduction construction, and (4) airport-related uses.

The area affected by airports operations is normally termed the airport's "environs." Generally, aircraft noise is the principal consideration in determining an airport's area of influence, but other factors such as a local circulation system, area development plans, or terrain, are often included in the formulation of the influence area. Within the airport environs, planning and zoning authority provide the ability to preserve opportunities for airport development and minimize off-airport land use incompatibility. With a clear policy established regarding land use in proximity to an airport and with the regulatory mechanisms to assure implementation of that policy, off-airport development decisions can be

made easily and rapidly. Unfortunately, the importance of this approach is often misunderstood or disregarded. There are numerous examples of development - particularly residential development - permitted within areas subject to airport noise. In some instances residents tolerate the noise; in other cases, noise becomes a catalyst for lawsuits and demands for airport closure. Certainly there are enough examples of this problem in the Bay Area to underscore the importance of adequate advance planning, the development of regulations, and the adherence to plans which avoid land use incompatibilities.

The most direct approach to preclude or eliminate a land use which is incompatible with an airport use is outright acquisition. While this method is the most desirable, it also has the drawback of being the most costly. Another option is the avigation easement. This is a legal mechanism under which the airport secures the right to make noise when aircraft fly over a particular piece of property. Normally an easement is acquired from a landowner and "runs with the land." That is, once secured, an avigation easement remains with the airport regardless of subsequent sales or transfers in ownership of the property. Avigation easements are often secured in an attempt to eliminate noise suits brought against an airport, but they do not necessarily assure compliance with applicable noise standards.

The best approach to avoiding incompatible uses around an airport is unquestionably through a program of planning and zoning. Traditionally, there are a number of land uses which can sustain a high sound level. These include manufacturing; transportation, communication and utilities; wholesale and some retail trade; resource production and extractive uses; and other open uses which are not also serving a public recreation purpose. Among the uses most sensitive to airport noise are residential uses; service uses such as business, professional and educational activities; and cultural, entertainment, and certain recreational activities. (It must be recognized that this list is a generalization and there are notable exceptions. For example, a location adjacent to an airport may not be suitable for the manufacture of scientific instruments while a well-insulated apartment building with interior recreational facilities and a de-emphasis on outdoor use may be suitable in an area impacted by some airport noise.)

Zoning is widely recognized as the most readily available tool for implementing land use plans and policies. To control land use adjacent to an airport, zoning regulations should recognize the presence of an airport and respond to it. The authority for zoning around the airport area rests with Fremont, Milpitas, and San Jose. Since zoning is rarely retroactive, the best chance of using zoning to insure land use compatibility is clearly before an area is developed. The zoning designations around the airports should prohibit most residential uses in addition to hospitals, schools, churches and other noise-sensitive uses, and permit compatible uses. However, because zoning is subject to change, it has to be continually monitored to insure that it serves the purpose for which which it was intended.

THE NOISE ENVIRONMENT

The major potential conflict between continued airport use and off-airport development centers on noise impact.

Human reaction to the intrusion of aviation noise is complex and subjective. Several descriptors have been developed in an attempt to rate the annoyance associated with living and working with aviation noise. In general, these descriptors attempt to measure quantitatively the acoustical energy of the sound and relate this to the subjective feelings of loudness, noisiness or annoyance. Though measures of the noise environment alone cannot provide an accurate prediction of the degree of human annoyance, they are helpful in determining approximate degrees of annoyance that may be associated with a given level of noise intrusion.

For evaluating the exposure of individuals to noise from airports, the appropriate unit is a cumulative noise measure, i.e., one which averages the total acoustic energy of multiple aircraft events. While people certainly respond to the noise of single aircraft flyover - particularly to the loudest single event in a series - the long-range effects of prolonged exposure to noise appear to best correlate with cumulative measures. These measures provide a single number which is equivalent to the total noise exposure over a specified time period. In other words, cumulative noise measurements provide information on the total acoustical energy associated with the fluctuating sound during the prescribed time period or the total time over which the sound level exceeds a predetermined threshold. Cumulative noise units are based on both time and energy. A further sophistication is achieved by basing the cumulative noise measure on single event measurements where the frequency spectrum of each event is weighted to approximate the response of the human auditory system.

The technique used to describe the aviation noise environment at the Fremont Airport is the Community Noise Equivalent Level or CNEL, a cumulative noise measurement developed for the State of California. The CNEL methodology describes the aircraft sound environment in terms of contours which connect points of equal noise exposure intensity. It is computed mathematically by considering: the transmitted noise event; the number of operations occurring during the day (7 A.M. to 7 P.M.), evening (7 P.M. to 10 P.M.), and night (10 P.M. to 7 A.M.); runway utilization; flight tracks; and takeoff and landing profiles for each distinct class of aircraft operating at the airport.

Although several federal programs include noise standards or guidelines as part of their eligibility performance criteria, <u>the primary responsibility for integrating airport noise considerations into the planning process rests with local government</u> which generally has exclusive control over actual land use and development.

Under Title 21 of the State Public Utilities Code, state-wide aeronautic noise standards are established which specify that jurisdictions with responsibility over airport operations must be in conformance with a

numerical limit above which the noise environment is considered not suited for specified uses. As of January 1, 1986, the noise impact boundary will be defined by the 65 CNEL (Community Noise Equivalent Level) contour. This means that within the area defined by this particular noise contour, only certain uses are considered compatible.

However, Title 21 standards are not enforceable until such time as a noise problem is declared to exist, and a specified process must be undertaken in order to arrive at that finding. The process is spelled out in Title 21, Article 8, Section 5050(b), which states:

> In recognition of the requirement to allow the maximum amount of local control and enforcement of this regulation, the county shall determine which of the airports within its boundaries are required to initiate aircraft noise monitoring in accordance with these regulations. The county shall require noise monitoring by the airports within its boundaries that are deemed to have a noise problem as determined by the county. For airports with joint use by both military and civilian aircraft operations, the determination of the existence of a noise problem shall be based upon the civilian operations. In making a determination that a noise problem exists around an airport, the county shall:
>
> (1) Investigate the possible existence of a noise impact area greater than zero based on a CNEL of 70 dB, and determine whether or not people actually reside inside the noise impact boundary.
>
> (2) Review other information that it may deem relevant, including but not limited to complaint history and legal actions brought about by airport noise; and
>
> (3) Coordinate with, and give due consideration to the recommendations of, the county airport land use commission (as defined in Public Utilities Code Section 21670).

Title 21 standards indicate that an airport must be managed so that the criterion CNEL contour (70 CNEL on January 1, 1981 and 65 CNEL on January 1, 1986) do not encompass single and multi-family uses, mobile homes, or schools of standard construction - unless these existing or proposed uses have been acoustically treated or are subject to an avigation easement.

In addition to these noise criteria levels, another set of standards is imposed by a separate section of the California Administrative Code which is relevant within the 60 to 65 CNEL. Under Title 25, Chapter 1, Subchapter 1, Article 4, a set of Noise Insulation Standards specify that in all new hotels, motels, apartment houses, and dwellings other than detached single family dwellings, the interior CNEL attributable to exterior sources (measured with windows closed) must not exceed an annual CNEL of 45 dB in any habitable room. Since the average California residence gives some 20 dBA protection (reduction of noise levels from outside to inside) with windows closed and single pane glass, the likelihood of any significant degree of impact appears remote. But this

same section of the Administrative Code requires that residential structures (other than detached single family dwellings) to be located within an annual CNEL contour of 60 must provide an acoustical analysis showing that the structure has been designed to limit intruding noise to the prescribed allowable levels.

Contour values of 55 to 75 CNEL are commonly mapped for planning purposes since the compatibility of various land uses and human activities vary with the sound level: the higher the CNEL value, the greater the degree of impact and the fewer types of compatible land uses. Two of the accompanying charts are based on recommendations of the Department of Housing and Urban Development (HUD) and portray uses and activities which are considered compatible with a wide range of CNEL values. In addition, a third chart summarizes the FAA's new "Part 150" order describing uses considered compatible with various noise levels and some of the mitigation measures necessary to increase compatibility.

The future year (2000) average annual aviation noise environment has been developed using the methodology prescribed in the FAA's "Developing Noise Exposure Contours for General Aviation Airports" (FAA-AS-75-1). Although distinct CNEL contour values are presented graphically, it should be understood that the actual noise environment changes gradually to either side of a contour line. This means that the noise contour is not permanent and fixed, but that it shifts based on a number of variables such as pilot technique, weather, takeoff and landing profiles, weight loads, and so on.

For the Fremont Airport, noise modeling assumptions were based on an intersecting runway system which would be managed to minimize off-airport noise impact. Runway 13-31 would handle most take-offs and Runway 15-33 would handle all touch-and-go traffic plus most of the landings. Specific noise modeling assumptions were:

1. Aviation forecasts are those prepared for this study. Mean-day operations are equal to the number of annual operations divided by 365.

2. Distribution of propeller aircraft operations in time is 99 percent day and evening (7 A.M. to 10 P.M.) and 1 percent night (10 P.M. to 7 A.M.).

3. Runway 13-31 is 3,000 feet long and Runway 15-33 is 2,400 feet long.

4. Annual operations by type of aircraft in the year 2000 are:

	Runway 13-31	Runway 15-33
Single Engine	79,290	319,918
Multi-Engine	9,055	36,537

5. The annual allocation of runway operations is based on wind direction, i.e., the wind blows predominantly from the north and northwest. While 90 percent of the annual operations are allocated entirely to Runways 31 and 33, the remaining 10 percent is allocated entirely to Runway 15. For noise abatement purposes, no operations

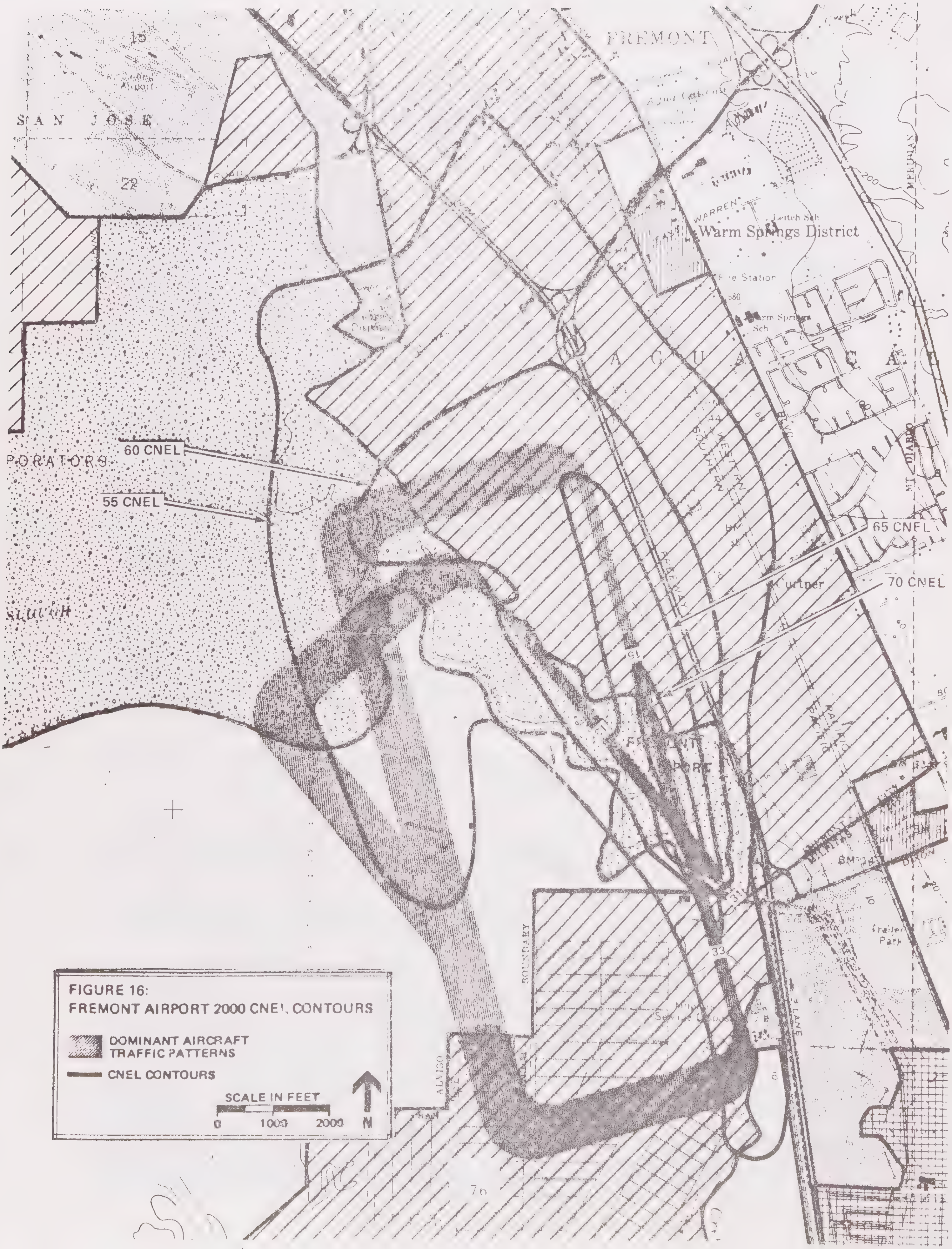


FIGURE 16:
FREMONT AIRPORT 2000 CNEL CONTOURS

are allocated to Runway 13 in order to avoid overflying noise-sensitive areas.

6. In the preparation of noise contours, standard left traffic flight patterns were assumed for operations on Runways 31 and 33, and a right pattern for operations on Runway 15.

7. Because the FAA publications has no technique for evaluating helicopter noise, and inasmuch as such noise is different in character, duration and perceived human impact than noise generated by fixed wing aircraft, helicopter operations were not included in calculations.

Noise contours developed for the 1980 level of operation were included in an earlier section of this report and indicated that the 65 CNEL, i.e., the noise contour that is generally considered the initial indication of an unacceptable level of sound, remained close to the airport's runway. By the year 2000, when annual operations are forecast to increase almost seven-fold, the 65 CNEL contour remains west of the Nimitz Freeway as do all flight tracks flown by aircraft arriving and departing the facility.

The noise contours portrayed for the Fremont Airport are based on a noise abatement program that places heavy emphasis on the use of Runway 33 for arrival and departure. Overall, Runway 15 is expected to handle approximately 10 per cent, and Runway 33 70 per cent. Runway 13 will not handle any operations in order to avoid flights above residentially developing areas.

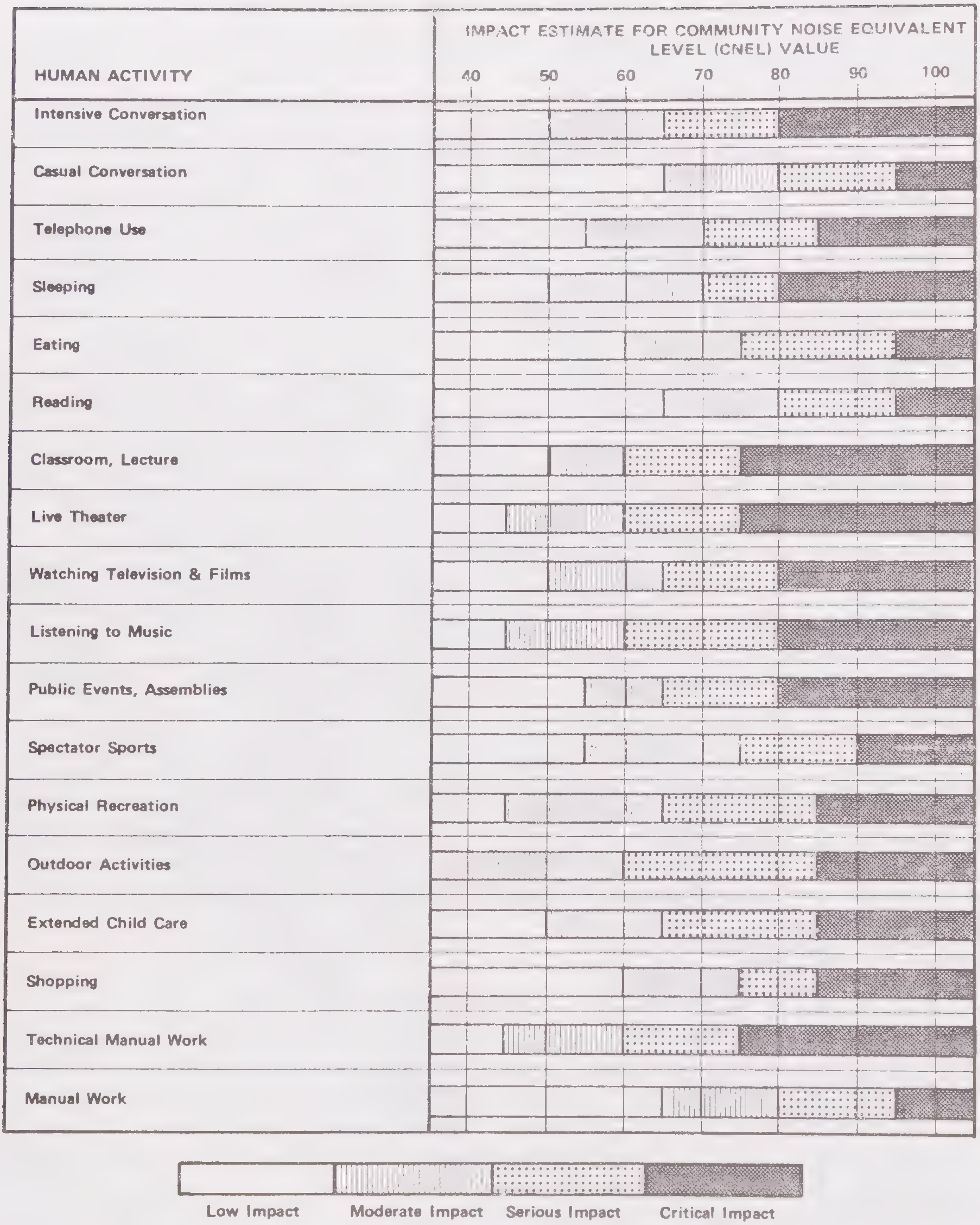
The effect of this management approach to noise abatement is that all contours forecast for the year 2000 - up to and including the 55 CNEL - fall within areas planned or zoned for uses that are compatible with aircraft-generated sound levels. The sound associated with the existing and proposed industrial development west of Warm Springs Boulevard, coupled with the sound of automobile and truck traffic on Warm Springs Boulevard and the Nimitz, will mask the 55 CNEL generated by aircraft at the Fremont Airport.

THE SAFETY ENVIRONMENT

In addition to the airport noise analysis, it is important to consider the safety of operations at Fremont Airport from two different perspectives: that of the people who may one day live or work in the area around the airport and that of the pilot who must fly into an airport that lies within a developed and developing area.

Planning for the Safety of Residents

The fear of aircraft accidents is not uncommon in communities near airports and is particularly a concern when aircraft approach and depart over inhabited areas. Indeed, fear of accidents may compound citizen concern for airport area noise problems, resulting in two levels of concern for airport safety planning - the actual level of hazard and the perceived level of hazard.



Low Impact: Activity can be performed with little or no interruption from aircraft noise, though noise may be noticeable above background levels.

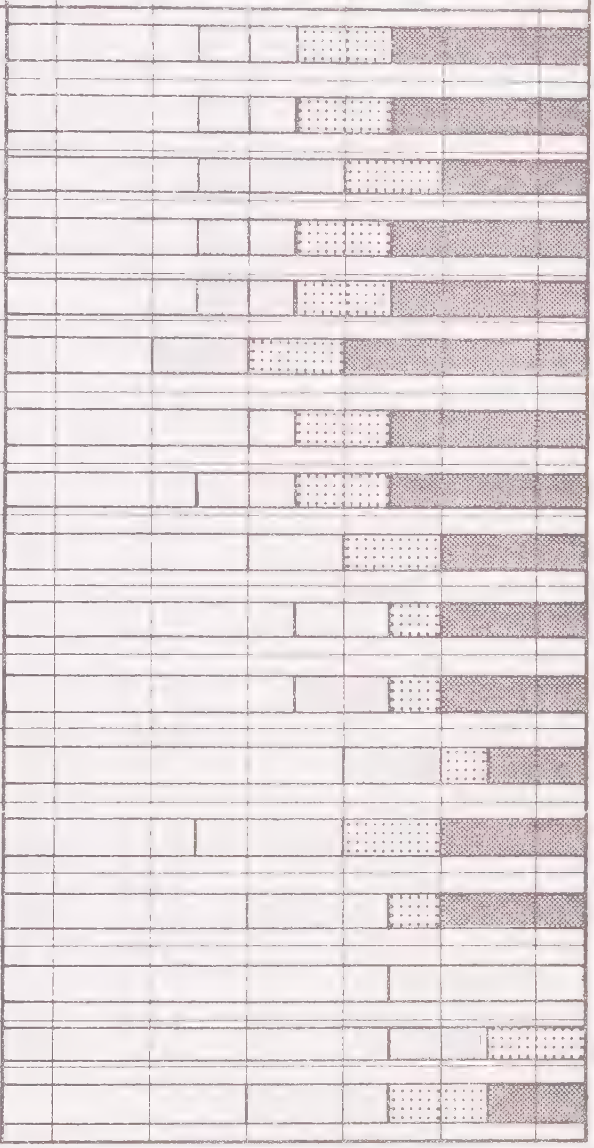
Moderate Impact: Activity can be performed but with some interference from aircraft noise due to level or frequency of interruptions.

Serious Impact: Activity can be performed but only with difficulty in the aircraft noise environment due to level or frequency of interruptions.

Critical Impact: Activity cannot be performed acceptably in the aircraft noise environment.

FIGURE 17: AVIATION NOISE IMPACT ON HUMAN ACTIVITIES

LAND USE CATEGORY	STANDARD LAND USE CODE	LAND USE INTERPRETATION FOR COMMUNITY NOISE EQUIVALENT LEVEL (CNEL) VALUE 40 50 60 70 80 90
Residential - Single Family, Duplex, Mobile Homes	11	
Residential - Multiple Family, Dormitories, etc.	11,12,13,19	
Transient Lodging	15	
School Classrooms, Libraries, Churches	68 7111	
Hospitals, Nursing Homes	651	
Auditoriums, Concert Halls, Music Shells	721	
Sports Arenas, Outdoor Spectator Sports	722	
Playgrounds, Neighborhood Parks	761, 762	
Golf Courses, Riding Stables, Water Rec., Cemeteries	741, 743, 744	
Office Buildings, Personal, Business and Professional	61, 62, 63, 69, 65	
Commercial - Retail, Movie Theaters, Restaurants	53, 54, 56, 57, 59	
Commercial - Wholesale, Some Retail, Ind., Mfg., Util.	51, 52, 64, 2, 3, 4	
Manufacturing, Communications (Noise Sensitive)	35, 47	
Livestock Farming, Animal Breeding	815, 816, 817	
Agriculture (except Livestock), Mining, Fishing	81, 82, 83, 84,85,91,93	
Public Right-of-Way	45	
Extensive Natural Recreation Areas	91, 92, 93, 99, 7491, 75	



Clearly Acceptable | Normally Acceptable | Normally Unacceptable | Clearly Unacceptable

<u>Clearly Acceptable:</u> The noise exposure is such that the activities associated with the land use may be carried out with essentially no interference from aircraft noise.
<u>Normally acceptable:</u> The noise exposure is great enough to be of some concern but common building constructions will make the indoor environment acceptable, even for sleeping quarters. The outdoor environment will be normally acceptable for residential area recreation and play.
<u>Normally Unacceptable:</u> The noise exposure is significantly more severe so that unusual and costly building constructions are necessary to ensure adequate performance of activities. The outdoor environment will be normally unacceptable for residential area recreation and play.
<u>Clearly Unacceptable:</u> The noise exposure at the site is so severe that construction costs to make the indoor environment acceptable for performance of activities would be prohibitive. The outdoor environment would be intolerable for normal residential use.

FIGURE 18: AVIATION NOISE COMPATIBILITY INTERPRETATIONS

FIGURE 19:
FAA GUIDELINES FOR LAND USE COMPATIBILITY (PART 150)

	DAY—NIGHT AVERAGE SOUND LEVEL (Ldn)					
	Below 65	65 - 70	70 - 75	75 - 80	80 - 85	Over 85
RESIDENTIAL						
Residential, other than moblie homes and transient lodgings		A	A			
Mobile home parks						
Transient lodgings		A	A	A		
PUBLIC USE						
Schools, hospitals, nursing homes		25	30			
Churches, auditoriums, concert halls		25	30			
Governmental services			25	30		
Transportation			B	C	D	D
Parking			B	C	D	
COMMERCIAL USE						
Offices, business, professional			25	30		
Wholesale/retail-building materials, hardware, farm equipment			B	C	D	
Retail trade-general			25	30		
Utilities			B	C	D	
Communication			25	30		
MANUFACTURING AND PRODUCTION						
Manufacturing, general			B	C	D	
Photographic and optical			25	30		
Agricultural (except livestock), forestry		F	G	H	H	H
Livestock farming and breeding		F	G			
Mining, fishing, resource production and extraction						
RECREATIONAL						
Outdoor sports arenas and spectator sports		E	E			
Outdoor music shells, amphitheaters						
Nature exhibits, zoos						
Amusements, parks, resorts, camps						
Golf courses, riding stables, water recreation			25	30		

Land Use and related structures compatible without restrictions

Land Use and related structures may be compatible under certain conditions

Land Use and related structures are not compatible and should be prohibited

25 30 or 35 — Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of structure

A Where the community determines that residential uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round.

B Measured to achieve NLR of 25 must be incorporated into the design and construction of portions of these buildings where the public is recieved, office areas, noise sensitive areas or where the normal noise level is low.

C Measures to achieve NLR of 30 must be incorporated into the design and construction of portions of these buildings where the public is recieved, office areas, noise sensitive areas or where the normal noise level is low.

D Measures to achieve NLR of 35 must be incorporated into the design and construction portions of these buildings where the public is recieved, office areas, noise sensitive areas or where normal noise levels are low.

E Land use compatible provided special sound reinforcement systems are installed.

F Residential buildings require an NLR of 25.

G Residential buildings require an NLR of 30.

H Residential buildings not permitted.

Any assessment of safety must be conducted with recognition that the safety record of aircraft is one of the best of any transportation mode and that aircraft accident rates continue to decline. However, while an aircraft accident is of a low probability, it is a high-consequence event. Clearly the risk of accidents is implicitly accepted by those who choose to fly, but the general public is often uncertain of the degree of hazard to those living in the vicinity of airports.

Aircraft accident rates vary from airport to airport and from year to year, but the trend is one of lowering accident rates over the years. It is sometimes difficult to perceive this trend, however, since there has been a considerable growth in general aviation operations over the years. Thus accident rates are decreasing, but since the number of annual operations is increasing, the potential for the number of total accidents rises.

While there are many factors involved in aircraft accidents and statistics have been completed by the National Transportation Safety Board and the FAA, it may be generally stated that the probability of accidents is most likely on takeoff while the engine and crew are under stress. The second most likely time of accidents is during landings, primarily during instrument operations. The most common type of accident is engine failure, accounting for 44 percent of accidents. The second most common is stall-spin accidents which account for 20 percent of all accidents. Short landing type accidents account for approximately 10 percent of accidents with 6 percent resulting from aircraft colliding with obstructions near the airport.

A comprehensive analysis by the National Transportation Safety Board (NTSB) in 1970 revealed that of approximately 5,000 civil aircraft accidents, 49 percent occurred within the airport boundary, 14 percent outside the boundary but within one mile of the airport, and the remaining 37 percent well away from the airport area. Data compiled over a longer period by the NTSB on civil aircraft accidents in California from 1964 to 1973 reinforces these nationwide findings. In this later study, data showed that of slightly more than 5,700 aircraft accidents in the study period, 59 percent occurred on the airport property, 8 percent in the traffic pattern and 2 percent within a quarter of a mile of the airport. Another 3 percent of the accidents occurred between a quarter-of-a-mile and one mile of the airport. Thus a total of 72 percent of all accidents occurred either on the airport or within one mile.

These findings are significant for airport safety planning because they define the area where most accidents are likely to occur: under flight patterns and within one mile of the airport. It should also be kept in mind that there is an important difference in accident frequency at various distances from runway ends.

For the Fremont Airport at the year 2000 operational levels, the following theoretical probabilities for accidents were estimated based on aircraft accident trends:

TABLE 13
PROBABILITY OF AIRCRAFT ACCIDENTS

Accidents Per Year	2000
None	.54
One	.33
Two	.11
Three	.02

While the likelihood of an accident at and near the airport becomes probable as operations increase, it must be emphasized that the vast majority of aircraft accidents are minor ones with no injuries involved. A recent review of civil aircraft accidents indicates that 78 percent of most crashes involving light general aviation aircraft resulted in only minor or no injuries and in some 7 percent of all accidents, serious injuries occur. Further, the probability of nonoccupant fatalities resulting from accidents at any general aviation airport is remote.

The FAA Safety Data Branch recently provided data on general aviation accidents involving a third party (i.e., someone other than a pilot or passenger) which occurred between January 1, 1973 and November 6, 1980. That information indicated that within the almost eight years covered by the data, there was a total of 178 accidents throughout the entire United States which involved a third party and, of those accidents, there were 85 third party fatalities. Of these fatalities, 58 occurred on the airport. Thus in almost eight years, there were 27 people killed as a result of general aviation accidents who were neither at an airport nor the pilot nor passenger in the plane. That figure represents less than four fatalities per year throughout the entire United States. By comparison, data from the National Center for Health Statistics shows that in recent years approximately 125 people were killed annually by lightning, 100 by tornadoes, and more than 150 by flash floods.

One of the reasons the number of third party fatalities is so low is that development is typically prohibited in areas subject to high safety risks. Moreover, because most communities are concerned about the safety of residents, there is usually a conscious attempt to discourage development - especially residential uses - from those areas where safety is a recognized issue. Therefore, while the chance of a nonoccupant fatality is slight, the concern for and probability of an accident on or near the airport is sufficient to consider establishing a safety zone near the airport.

Given the probability of accidents within the vicinity of airports, certain distances should be used in determining an area for compatible land use planning, although safety zones based on these considerations are not now required by the FAA. In establishing the width of a safety zone, the most common determinant is based on the behavior of aircraft on takeoff and landing. Whether it is the result of pilot error or mechanical failure, an aircraft that stalls or spins tends to depart significantly from the original line of flight. Analysis of

accidents near airports indicates the distance of 750 feet to either side of the intended line of flight is a reasonable limit of this horizontal movement.

A schematic of safety zones is shown on Figure 20. The primary safety zone generally should extend approximately one-quarter mile from the ends of a runway but should never be less than the clear zone lengths established for an individual runway. Within the primary safety zone, structures should be discouraged with the exception of those to aid navigation. The secondary safety zone abuts the primary one and extends for approximately 3500 feet from each runway end. Within this zone, preferred uses should be low occupancy ones including agriculture, parks, and certain commercial and industrial activities such as parking lots, corporation yards, warehouses, and sewage treatment plants. Residential uses should be discouraged but, if permitted, they should be very low density. The density or intensity of uses permitted within this secondary safety zone is an expression of local policy regarding the level of risk a jurisdiction feels is appropriate in response to airport safety considerations. Both the Alameda and Santa Clara County Airport Land Use Commissions recognize similar safety zones.

While these primary and secondary safety zones designate locales of higher aircraft accident probability, residents of other areas subject to frequent and audible overflying aircraft may also become apprehensive about their personal safety. Residential uses located directly beneath a flight pattern, and particularly those which are sited at the point where aircraft typically enter or depart the flight pattern, are most susceptible to this heightened concern. It is therefore often in the best interest of a community to avoid concentrations of residential development in such areas, even though statistics indicate a very low probability of aircraft accidents, and even though the area may be outside the 55 CNEL noise contour.

Planning for the Safety of Aircraft

In order to make airports safe for air navigation and reduce the chance of aircraft accidents, the FAA has established a series of airport safety standards contained in Federal Aviation Regulations, Part 77. FAR Part 77 divides the area surrounding an airport into a series of zones collectively known as the airport's "imaginary surfaces". These imaginary surfaces describe the boundaries of the space used by air traffic and are shown diagrammatically in Figure 21. Any penetration of these surfaces affects navigable air space and may constitute an obstruction.

The names of the individual components of the imaginary surfaces are the same for all airports, but their dimensions vary based on factors such as runway length, type of instrumentation at an airport, aircraft using the facility, and so on. Since the significance of the imaginary surfaces is that they should remain free of obstructions to facilitate the safe movement of aircraft, a height zoning and hazard ordinance should be adopted for the Fremont Airport. This ordinance, to be incorporated

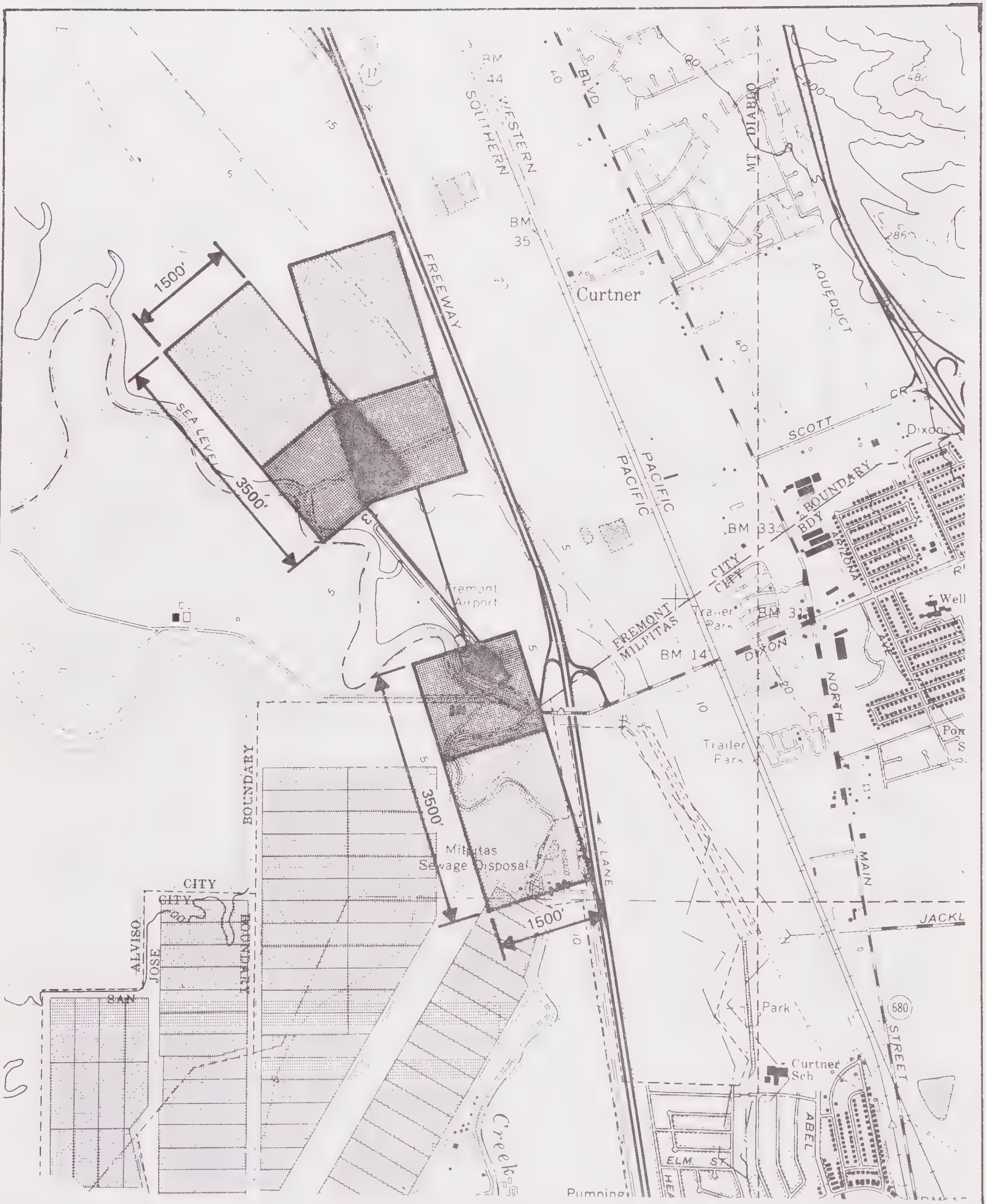


FIGURE 20: SAFETY ZONES

PRIMARY SAFETY ZONE

SECONDARY SAFETY ZONE

SCALE IN FEET

0 2000

N

within the zoning code, regulates and restricts the height of structures and objects that are enclosed within the spaces represented by the imaginary surfaces.

In addition to the location and height of structures, a hazard to aviation is also created by the presence of certain uses which interfere with the safe operation of aircraft. For this reason, the hazard ordinance identifies certain impacts which, if they were to result from any type of use near the airport, could effect the safety of aircraft operations. The ordinance thus restricts any use of land or water which would result in the creation of electrical interference with navigational signals or radio communication between the airport and aircraft, lighting which would make it difficult for pilots to distinguish between airport lights and others, and glare, smoke or any other effect which would impair visability in the vicinity of the airport.

EVALUATION

If a new airport is developed at the site of the existing Fremont Airport following the recommendations included in this study, the potential for off-airport land use compatibility is high. But to assure that compatibility, the operation of aircraft at the facility must be carefully managed.

The setting and planned land use around Fremont Airport contains elements that are rare and highly sought in new airport development. Specifically, the Fremont site is a location with excellent ground access that is close to the source of demand and one where existing and planned uses buffer airport impact from the community. The location and orientation of the runways are intended to divert traffic from flying over residentially developed and developing areas of Milpitas and Fremont and, instead, to have traffic overfly industrially-developed or open bay lands.

Both in theory and in practice, off-airport land use compatibility is possible. But it will not happen without a cooperative commitment from the airport and several local jurisdictions. Most important among the responsibilities to be assumed if the airport is to operate successfully are:

1. Land that is currently planned and/or zoned for industrial use in the vicinity of the airport must be retained and developed in that use. This is particularly important for lands falling within the "airport environs," a zone that comprises at least the area within the forecast 55 CNEL contour and the recommended safety zones.

2. All development that is to occur within the airport environs should be evaluated in the planning stage to assure locational and operational compatibility with the airport. Regardless of the apparent compatibility of a use with the airport, some otherwise suitable use could locate too close to the end of R/W 15 threshold creating a psychological safety hazard and to a degree a real hazard to aircraft operations on RW 15-33 inasmuch

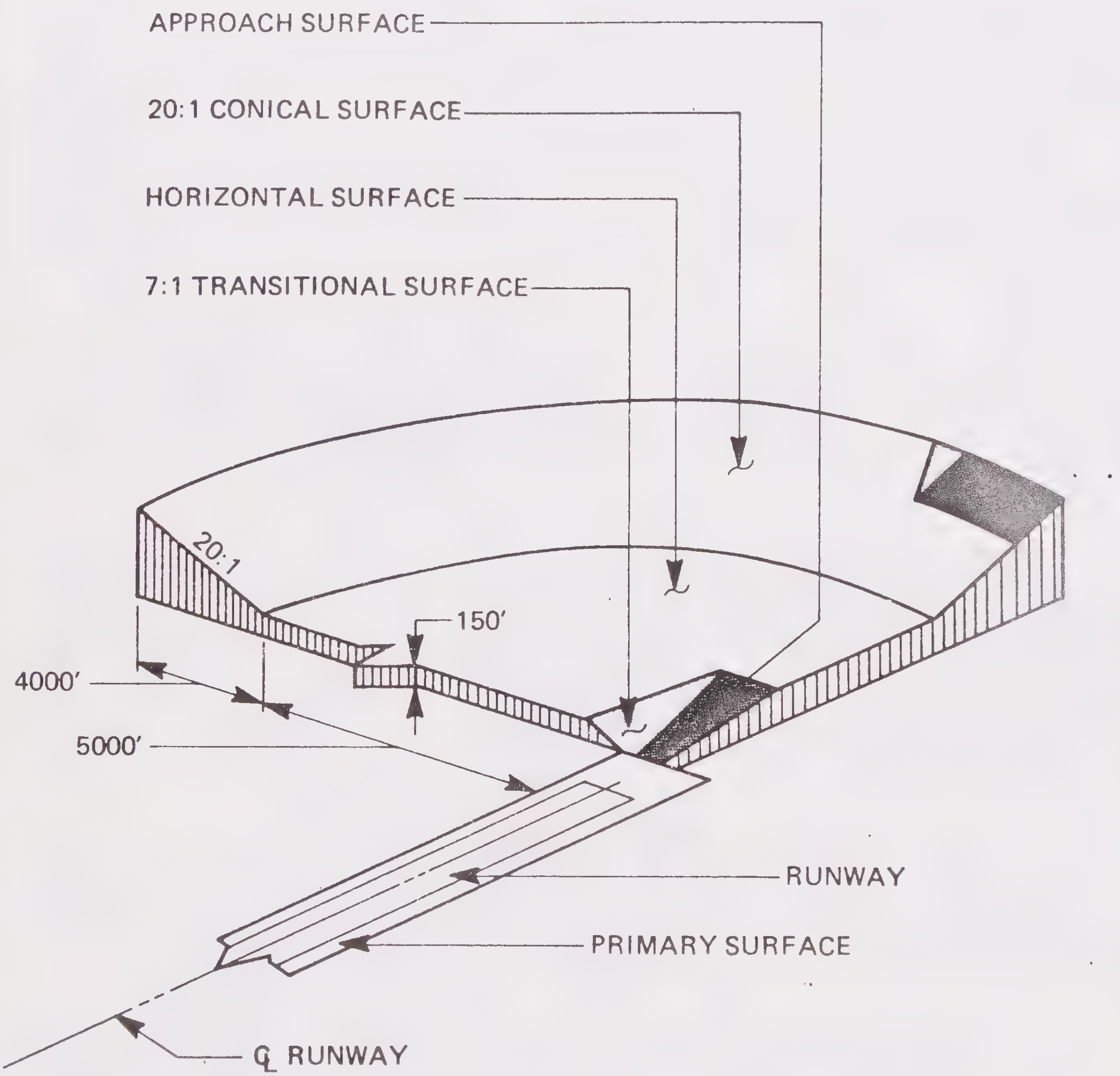


FIGURE 21: PART 77, IMAGINARY SURFACES
(ISOMETRIC VIEW)

as 90 per cent of all landings will take place on Runway 15 and 45 per cent of all takeoffs will occur on Runway 33.

3. The Fremont Airport cannot safely and satisfactorily operate and handle the level of traffic forecast in this study unless there is a control tower at the facility. This is true when annual operations are less than 200,000 (i.e., the FAA "entry level" for funding of a tower) since a tower is the most positive method of assuring compliance with the noise abatement takeoff and landing system.

4. All pilots using the Fremont Airport must be made aware of the noise abatement program at the airport.

While the emphasis of this section has been on actions to minimize undesired noise impacts, two other land use concerns described in the initial site evaluation must be raised once more.

There is an unusually large number of public agencies, boards, and commissions who define their jurisdiction to include some portion of the Bay near or involving parts of the Fremont Airport site. While the specific legislated and/or adjudicated jurisdiction of some agencies remains unclear, there is no doubt that the airport sponsors would have to secure a permit from the U.S. Corps of Engineers and that the process of so doing would involve other federal, state, regional, and local agencies. While the process of securing a construction permit from the Corps will be a lengthy one, it should be done so with the recognition that the majority effort of this study has been directed to developing an airport design that met a significant portion of forecast demand and which minimized undesired impacts on the natural and manmade environment. Off airport land use compatibility is extremely high and airport design has been revised several times to preserve environmental values.

A second consideration involves the use of Newby Island, which lies just west of the Fremont Airport, as a sanitary landfill. The Corps of Engineers is now reviewing an application to allow expansion of the landfill which will permit another 40 years of operation. If that permit is not granted, the landfill would cease operation in approximately four years.

The presence of the landfill has not created a bird strike hazard at Fremont Airport because of special landfill procedures used at Newby Island. However, the existence of a landfill so close to the airport will require a special waiver for Fremont Airport from the FAA. The FAA District Field Office in Burlingame indicates that it will be necessary for the FAA to conduct a study to determine the degree of hazard present and, based on satisfactory findings, could then grant a waiver. While it would be better not to have a landfill close to the airport, the continued use of landfill practices at Newby Island which severely constrain the clustering of birds could allow successful operation of the airport.

FINANCIAL PLANS

7. SCHEDULES AND COST ESTIMATES

Schedules and cost estimates of improvements proposed in the feasibility study are presented in three stages. All projects should be undertaken when demand justifies development. The improvements program is presented in the Stage Development illustration, and cost estimates of projects follow.

The objective of the first stage of development, 1982-1985, is all land acquisition and construction of an entirely new airport system involving airfield, terminal and access area earthwork; site drainage systems; construction of airport fencing; development of two medium-intensity lighted basic utility runways with parallel taxiways; rotating beacon and lighted wind cone. Terminal area development includes hangar storage buildings for parking of approximately 72 aircraft and apron adequate for based and transient aircraft expected to visit the airport during the first period. The terminal area will have floodlighting to assure safe operations at night and to provide an added degree of security. Extension or construction of all required utility systems are identified for development during the first stage. Other improvements include construction of the internal access roads and auto parking. Facilities to be developed by private enterprise during the first period include new fixed base operator building, and fuel storage facilities.

The first stage of development will take place over several years, and will be divided into steps. The initial step would be land acquisition and site preparation aspects such as earthwork and major drainage systems. Development to follow in subsequent years are construction of runways, taxiways, public apron and airport access road completion. The end of the first stage would involve installation of hangar taxiways and construction of hangars for based aircraft.

The second stage of development, 1985-1990, involves additional hangar taxiways, hangar and apron construction and installation of a variety of items not identified for first stage development merely to spread the development costs over a greater time span. These items that would have been constructed initially but were delayed include visual approach slope indicators (VASI's) at the end of the runways, runway end identifier lights (REIL's), taxiway edge lighting to enhance nighttime operations, guidance signs for aircraft taxiing on the airport, and supplemental wind cones, one at each end of the runways to provide area specific wind information. In addition, two more fixed base operators are expected to develop facilities during this stage, as well as construction of initial portions of the public terminal building.

The third stage of development, 1990-2000, is expansion of apron and hangar parking for aircraft with associated security lighting and taxiways. Another fixed base operator is expected to develop facilities including a new building, and expansion of the fuel storage system. Also during this period is additional auto parking.

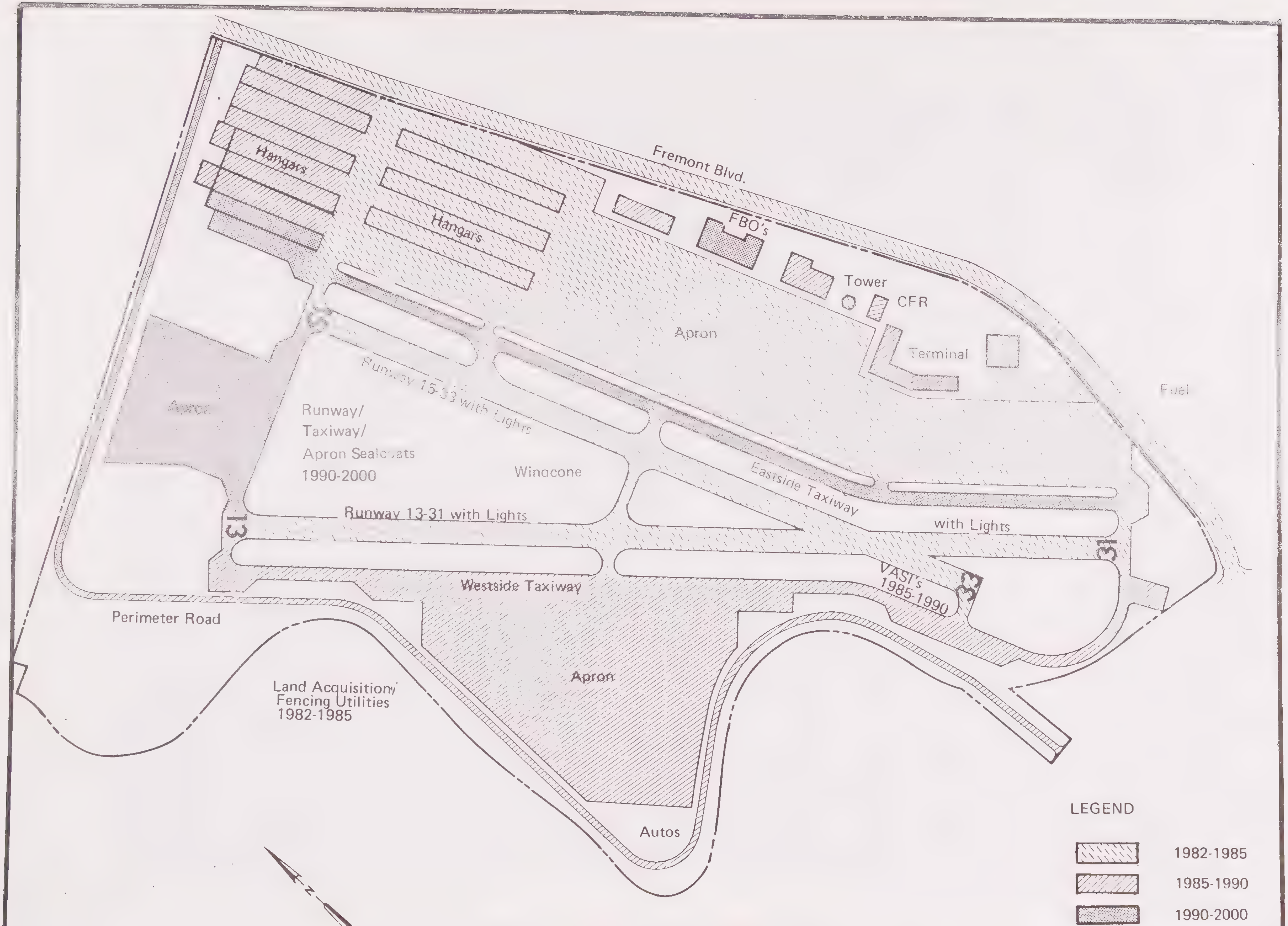


FIGURE 22: STAGE DEVELOPMENT PLAN

TABLE 14
STAGE DEVELOPMENT PROGRAM
(in 000's 1981 $)

		Planning Cost Estimate 1/		
	Comment Codes3	FAA Eligible	Non-Eligible	Total
STAGE I: 1982-1985 2/				
Land Acquisition		3,000.0	-	3,000.0
AIRFIELD AREA				
Creek Realignment Excavation	C	62.5	-	62.5
Drainage Retention Basin Excavation	C	375.0	-	375.0
Storm Drainage System	C	187.5	-	187.5
Storm Pump Station	C	250.0	-	250.0
Airfield Area Fill	C	448.1	-	448.1
Perimeter Road Fill	C	489.8	-	489.8
Runways	C	496.8	-	496.8
Parallel Taxiway and Exits	C	235.9	-	235.9
Medium Intensity Runway Lights	C	86.9	-	86.9
Taxiway Edge Reflectors	S	8.8	-	8.8
Lighted Wind Cone/Segmented Circle	S	12.5	-	12.5
Aircraft Traffic Counters	C	5.0	-	5.0
TERMINAL AREA				
Terminal Area Fill	C	3,090.0	-	3,090.0
Aircraft Parking Apron	C	917.1	-	917.1
Hangars	C,P	-	1,350.0	1,350.0
Hangar Taxiways	C	325.1	-	325.1
Security Floodlighting	S	60.0	-	60.0
Rotating Beacon	S	12.5	-	12.5
Fencing	S	62.5	-	62.5
Electrical Supply	C	93.8	-	93.8
Telephone	C	-	37.5	37.5
Water Supply	C	62.5	-	62.5
Sanitary	C	-	187.5	187.5
Entrance Signing	S	-	62.5	62.5
Fuel Storage	C,P	-	63.5	63.5
FBO Buildings	By FBO's	-	-	-
Auto Parking	By FBO's	-	-	-
TOTAL - STAGE I		10,282.3	1,701.0	11,983.3

	Comment Codes[3]	FAA Eligible	Non-Eligible	Total
STAGE II: 1985-1990				
AIRFIELD AREA				
Visual Approach Slope Indicators (VASI)	S	37.5	-	37.5
Runway End Indicators	S	25.0	-	25.0
Guidance Signs	S	87.5	-	87.5
Supplemental Wind Cones	S	5.0	-	5.0
Taxiway Lighting	S	250.0	-	250.0
TERMINAL AREA				
On-Airport Access Roads	C	105.2	-	105.2
Apron Expansion	C	622.8	-	622.8
Hangars	C,P	-	975.0	975.0
Security Floodlighting	S	70.0	-	70.0
FBO Buildings	By FBO's	-	-	-
Auto Parking	By FBO's	-	-	-
Crash-Fire-Rescue Facilities	S	-	62.5	62.5
TOTAL - STAGE II		1,203.0	1,037.5	2,240.5
STAGE III: 1990-2000				
Runway Overlay/Marking	R	221.4	-	221.4
Taxiway Overlay/Marking	R	105.2	-	105.2
TERMINAL AREA				
Apron Fill	C	800.2	-	800.2
Apron Expansion	C	281.5	-	281.5
Apron Overlay	R	408.7	-	408.7
Hangars	C	-	300.0	300.0
Hangar Taxiways	C	2.8	-	2.8
On-Airport Access Road	C	44.6	-	44.6
FBO Buildings	By FBO's	-	-	-
Auto Parking	By FBO's	-	-	-
Fuel Facility Expansion	C,P			
TOTAL - STAGE III		1,864.4	300.0	2,164.4
GRAND TOTALS: 1982-2000		13,349.7	3,038.5	16,388.2

NOTES: 1/ Cursory costs for planning purposes only. Includes 25% contingencies, engineering, and administration.

2/ Projects may extend into next time period because of inadequate funds available.

3/ Comment codes as follows: primary purpose of construction: S=safety; C=capacity; R=reconstruction of necessary facilities; P=private funding is possible.

The New Fremont Airport Stage Development Program table identifies projects within each time frame, as well as a letter code indicating primary purposes of development, such as "safety," "capacity," and "reconstruction" of necessary airfield facilities. It is recognized that priorities change with time, and grant applications should be made for development of portions of the improvement program to complete specific sub-areas of the airport. Improvement programs will have to be realistic and comply with FAA and local funding limitations. Some projects may have to shift to subsequent time periods, if funding is not available.

Order of magnitude costs are indicated for planning purposes only. The largest development projects occur in 1982-1985 due to the current need for a new facility. The costs are separated as to FAA eligible and non-eligible facilities. Items presently not eligible for FAA funds typically include auto parking and hangar buildings; however, all eligibility is subject to FAA review and the outcome of future legislation.

The airport land acquisition program should commence as soon as feasible. Land costs in the Fremont area are subject to escalation and change. There will, however, be no relocation of residences. The actual costs for the land acquisition are currently unknown. The cost estimates in this report are not based on appraisals. For purposes of this plan, it was assumed that the 141-acre land acquisition program may cost $3 million.

The Airport Development Cost Summary table identifies land and capital improvement costs, as well as eligibility and source of funds. The FAA portion is based on 90 percent funding. It is possible that certain items in the plan may be eligible for 100 percent funding through the FAA Facilities and Equipment (F&E) Program. These items include VASI´s and REIL´s. For the purpose of this cost estimate, it is assumed that FBO´s construct all fuel facilities in addition to their own buildings.

The Stage Development Program table identifies items which possibly could be developed by private enterprise. Items include facilities which would not be eligible for FAA funding such as the auto parking and the fueling facilities. Other developments which could possibly be constructed with private funds include apron expansion, security lighting, and T-hangar taxiways.

Since definitions of capacity in planning manuals incorporate a reasonable amount of maximum delay, the timing of development indicated provides airfield development benefits commensurate with costs. Each improvement is timed with respect to safety to users and with the goal of commencing facility development, preferably two to three years before demand exceeds capacity. Construction prior to the operational dates may occur depending upon the availability of funds, changes in demand, and other opportunities.

TABLE 15
AIRPORT DEVELOPMENT COST SUMMARY
(In 000's of 1981 $)

	1982-85	1985-90	1990-2000	Totals
Land Acquisition/ Relocations	$ 3,000.0	$ -	$ -	$ 3,000.0
Development Costs	8,983.3	2,240.5	2,164.4	13,388.2
Total	$11,983.3	$2,240.5	$2,164.4	$16,388.2
FAA-Eligible	$10,282.3	$1,203.0	$1,864.4	$13,349.7
Non-Eligible	1,701.0	1,037.5	300.0	3,038.5
Sources of Funds*				
FAA/State	$ 9,254.0	$1,082.7	$1,678.0	$12,014.7
Local	2,729.3	1,157.8	486.4	4,373.5
Total	$11,983.3	$2,240.5	$2,164.4	$16,388.2

* Assumes FAA and/or State contributes 90 percent of eligible items; local share is the remainder.

Source: Wadell Engineering Corporation

Throughout this section of the report, all costs are based on 1981 dollar values. Quantities are for minimum acquisition and improvements necessary to provide acceptable facilities to meet forecast demands. For planning purposes, the following multipliers may be applied to estimate future construction costs, although the future economy cannot be accurately projected:

Range in Multiplier of 1981 Costs

1981-1985	1.0 to 1.6
1986-1990	1.7 to 2.4
1991-1995	2.6 to 3.6
1996-2000	3.8 to 6.0

These escalations are based on an extrapolated average annual increase at 8 percent compound interest and a review of the Engineering News-Record (ENR) construction index costs over the past 15 years. It must be

recognized that there are many uncertainties with respect to forecasting costs, especially in long-range plans. The airport owner should incorporate adequate contingencies to cover changes in costs, sophistication of equipment, environmental protection requirements, and special studies or programs.

The above cost estimates are order of magnitude costs for planning and programming purposes only. Detailed soil investigations and the design process will result in more accurate estimates of probable development costs.

8. FINANCIAL ANALYSIS

LOCAL BENEFITS ASSESSMENT

Not many years ago, general aviation was comprised primarily of barnstorming flights, stunt flying, and pleasure trips. Unfortunately, there is a legacy from general aviation's early days that causes some to typify it as a costly transportation medium reserved for the wealthy. Today, general aviation is the largest, most far reaching, and in many ways, the most significant segment of America's air transportation system. General aviation airports contribute significantly to the prosperity of a community and are crucial elements in the economic well-being and safety of a city, county, and region.

Obviously, the role and function of a general aviation airport will differ from one location to another. Leisure travel is but one of the many types of uses to which a general aviation airport is put, but it is frequently and erroneously assumed to be the only use. Aircraft are used for firefighting and monitoring weather conditions and air quality levels. Almost universally, general aviation airports play an important role in medical evacuations, law enforcement, and mail delivery.

The advantages and benefits of air carrier service to a community are often readily apparent. But direct and indirect benefits of general aviation and other airport-related services are sometimes more difficult to assess. A general aviation airport such as the New Fremont Airport generates employment, tax revenues, and increased consumer spending within the area. A recurring consequence of an airport's growth or facility expansion is an increase in the number of local jobs and stimulated economic activity. At Fremont, forecast direct aviation-related employment is represented in the table below. In terms of payroll dollars, annual airport employment value could range from over $600,000 initially to over $2.5 million in the year 2000.

TABLE 16
TOTAL AIRPORT EMPLOYMENT
(Direct Impact)

	1985	1990	1995	2000
Airport Employment	30	75	100	125
Annual Payroll (In 000's of 1981 $'s)	$600	$1,500	$2,000	$2,500

Source: Wadell Engineering Corporation

Indirect employment would also result from services and businesses supporting the airport and its employees if business potential were developed. It is extremely difficult to measure this indirect impact, but it is obvious that growth of the airport will mean more dollars spent locally.

In general terms, the money flowing into the community is said to have a multiplier effect. That is, for every dollar spent by potential employees and businesses connected with the airport, additional income is generated. A formula for this type of analysis is:

$$\text{Income Multiplier} = \frac{1}{1-(x)\ (y)\ (z)}$$

Where x = % of income consumed rather than saved
y = % of consumer expenditures made within the area
z = % of related business expenditures made within the area

The higher the expenditures made within the area, the more income is generated from the original expenditure. A national average figure is 2.0 to 2.5, although it has been reported as high as 8 in some parts of Idaho.

Currently, the indicator for aviation activity at Fremont is estimated at 1.69. The "x" percentage is assumed to be 80 percent (100 percent less taxes and savings); and the "y" to be 60 percent, assuming most employees live within the area and do much of their major buying there; and "z" to be 85 percent, indicating that businesses do some of their major spending elsewhere. Thus a 1.69 multiplier used with the 1985 aviation payroll of $600,000 would have the effect of funneling over $1,000,000 into the Fremont area annually, which will grow to approximately $4.23 million by the year 2000.

TABLE 17
POTENTIAL GENERAL AVIATION AIRCRAFT EXPENDITURES

Aircraft Type	Cost/ Hour	Avg. Hours Flown	$/Based Aircraft	In 000's $ 1985	1990	1995	2000
Single	$ 35	200	$ 7,000	3,220	3,318	3,381	3,500
Multi	125	250	31,250	781	1,219	1,719	1,781
Helicopter	100	350	35,000	210	245	280	315
Estimated Total Amount Spent by Aircraft Owners:				$4,211	$4,782	$5,380	$5,596

Source: Wadell Engineering Corporation

General aviation aircraft operating expenses are also indicative of money being spent at an airport that eventually finds its way into the community. For each based aircraft there are dollars spent annually for fuel, oil, insurance, hangars/tie-downs, and routine maintenance. Assuming that purchases by itinerant aircraft at the airport equal based aircraft purchases abroad, the expenditure table above was derived, showing the potential for aviation businesses in the area if the airport has adequate space available and facilities.

While the presence of an airport and aircraft in a community is obvious, people are not always aware of how an airport interacts with and enhances the economic life of the community. Traditionally, a community's well-

being has always been tied to either transportation or communications. In the growth of the United States, those towns and cities located along railways for the most part grew and prospered while many others without access to good transportation routes faltered and died. The same case can be made for aviation.

Everyone is aware of the time-saving value of aircraft travel. Not everyone realizes the indirect economic values produced by air travel. In the fast-moving business world, an out-of-town businessman may arrive at the local airport in his business aircraft, close a large business deal within a few hours, and depart the same day without ever drawing the attention of anyone in particular. Yet, the consummation of that business deal, which might not have occurred without the local airport, will have a vital effect on the area's economy.

Today, there are approximately 12,000 airports in the United States. Of that amount, roughly a third are publicly owned, with the rest in private hands. These airports represent an investment of around $10 billion, and the majority of these facilities, like any other business, provide a return on the investment. With expected future investments of $13 billion to be added to the existing system within the next decade, one can see that capital flow generated by these airports is indeed substantial. For example, it has been estimated that the Burbank-Glendale-Pasadena Airport has an impact of more than $87 million annually on its broad market area (within 20-mile radius of airport) and generates a total direct and secondary employment of some 3,700 persons. The Sacramento Metro and Executive Airports contributed in a one-year period, from July 1978 to June 1979, over $600 million and 5,000 jobs in the Sacramento area, according to the School of Business at California State University.

General aviation activity represents over 61 percent of the aircraft miles flown annually to transport one-third of the people travelling by air to conduct business and provide industrial and agricultural services. A full spectrum of general aviation services and facilities at a local airport encourages visitors and acts as an incentive for business and industry to locate in the area.

FINANCING CONSIDERATIONS

A sound financial program is instrumental in the successful development of the airport. Proper planning, design, and feasibility studies are efforts spent in vain unless an adequate financing program can be developed to accomplish the improvements indicated.

A goal in airport financial planning is to achieve a sound economic operation, to provide an adequate level of public facilities, and to avoid taxpayer burdens by developing a reasonable financial return from the airport facility.

The desirability of future airport development depends on the ability of an airport to achieve a self-supporting status and, within a reasonable

time, to cover local development costs. Estimated revenues must be sufficient to help offset annual cost of capital investment and operations.

While the primary responsibility for financing proposed facility development rests with the sponsor, there are many ways that airport development funds can be supplemented. Money for capital improvements may come from a number of sources and may be used singly or in combination to accomplish airport development. Sources available during recent years for financing airport facilities include the FAA's Airport Development Aid Program, Federal revenue sharing funds, the State of California Department of Transportation, private donations, leasebacks, direct revenue loans, and revenue and general obligation bonds. Also, capital improvements can be financed from general funds that are provided by annual operating and tax revenues.

FAA funds for airport development are derived from user taxes and are available for land acquisition, construction, alteration, fire fighting, and crash rescue vehicles and facilities, etc., as well as for establishing and improving air navigation facilities. Publicly-owned and privately owned, public use airports are eligible for such aid provided the proposed project is included in the National Airport Systems Plan. Presently, the Federal share of these projects in California is 90 percent of eligible costs. In recent years, the annual general aviation funding in California by the FAA has been approximately $3 million, yet funding requests greatly exceed the available funds, even though the FAA has a $4 billion unspent trust fund surplus. Special allocations are available for new airport development, especially new reliever airports, such as New Fremont.

The California State Aeronautics Division provides funds for airport development, also collected from aviation users. The primary areas of assistance are for runways, taxiways, aprons, lighting, and other aircraft operational areas. The state aid is usually 90 percent of eligible project costs. Currently, the State Aeronautics division has approximately three million dollars annually for the entire state.

A non-profit corporation could lease portions of the airport, construct facilities, and then lease the entire improvement back for a fixed period of years, calculated to recoup the investment plus interest. Rates will be high, but no initial public capital is required for this form of financing. This might be one way to develop needed hangars, yet private enterprise is not eligible for Federal/State grants for hangar taxiways, at publically owned airports.

Private funds are sometimes available for the construction of specific airport facilities. This is so when investors believe that in financing certain facilities they have a reasonable chance of capital recovery. Interest rates are relatively high for the use of private capital. This is a source of funds for hangar and FBO areas.

Revenue bonds are sold with repayment based on income from anticipated revenues. Adequate earning capability of the project must be convincingly demonstrated. Earnings from the airport must go first toward retirement

of the bonds, and future financing may be inhibited while bond debt is outstanding. Interest rates are usually somewhat higher than for general obligation bonds. Revenue bonds are an excellent form of financing for air carrier runways, terminal buildings, and industrial parks, yet are not frequently used for most general aviation development.

The sale of general obligation bonds is backed by the taxing power of the community and is generally the most economical bonding method to finance airport development. Proceeds from the sale of general obligation bonds are available to finance private or exclusive operation facilities such as FBO facilities, T-hangars, and exclusive-use aprons. General obligation bonds are useful in financing public use facilities whether revenue producing or not, such as runways, taxiways, terminal buildings auto parking and others. After Proposition 13 in California, this method of new financing is now no longer practical.

Financing airport improvements directly from the general fund is often the most economical method of all, since there are no interest payments. Airport improvements financed by this approach could place constraints on money available from the general fund to meet normal operating and other expenses.

Taxes may be levied directly by the airport owner to finance airport facilities. This method is not always acceptable, since increased taxation is often unpopular. The airport benefits must be made sufficiently obvious to the affected taxpayers. It should be pointed out that the airport system is one of the area's vital transportation links and it should receive tax funds just as does a roadway system. New local taxes for aviation purposes are not practical after Proposition 13. Future legislation may allow this with the vote of the people.

An airport district or authority is commonly developed when one public agency is burdened with total airport costs, while other communities have the benefits and even taxation, but not the costs. Financial participation by Alameda and Santa Clara county jurisdictions is quite appropriate and should be pursued, since the airport benefits residents of both counties. A new district or authority could not create new taxes, but could sell revenue bonds.

FINANCIAL ANALYSIS

Pricing of airport services and facilities is a sensitive issue and one subject to considerable controversy. Often, each party has a different perspective and motivation. While a public entity may seek a yearly return equal to yearly expenditures, the private businessman wants primarily to maximize profits, and some airport users feel that a facility supported by public funds should be willing to charge less and operate at a deficit. Since Proposition 13, local governments have to be sure of covering costs, or must accept a deficit with the view that other community benefits are increased adequately to warrant a deficit.

Many airports seek to attain a high degree of self-sufficiency and, therefore, have rates and charges commensurate with the operating costs and capital improvement expenses. But frequently, local conditions and

circumstances preclude charging full actual costs and a public entity may choose to absorb some of the financial burden and not pass it on to the user.

The preceding section on Financing Considerations indicates some of the mechanisms typically used for financing airport projects. An early determination should be made by the airport owner as to the most desirable and feasible approach to initiate implementation. The only long-term satisfactory way to resolve concerns regarding financing is through a strong statement of airport financial policy and aggressive implementation of that policy. For this reason, it is essential that a financial policy and program be established and monitored regularly. It should, of course, be recognized that no matter what fees or charges are levied, they will no doubt be less than the vast majority of private facilities inasmuch as the airport owner can receive Federal funding for facility development.

The New Fremont Airport Financial Analysis, presented on the Cash Flow Assumptions 1985-2000 table, is a key element of the feasibility study. It is through this analysis that the stage development program's capital requirements and projection of annual operating income and expenses are brought together to establish an estimate of the airport's future financial condition over the twenty year planning period.

The Cash Flow Analysis is stated in terms of constant 1981 dollars and is based on several components:

- Operating income
- Operating expense
- Operating profit/loss
- New capital requirements (local share)
- Annual cash flow
- Accumulative cash flow

A philosophy and fee schedule must be established in order to assure that adequate operating income is collected. It will be necessary to generate significant revenue at the airport to provide for matching of FAA grants in order to implement the capital improvement program. The underlying assumption for the income schedule is that the local pilots and other users sincerely desire development of the new airfield and terminal facilities, and are willing to pay appropriate fees. The New Fremont Airport will compete with other airports in the region in terms of receiving Federal and State aid. Only airports with available grant matching funds can receive grants. It will be mandatory that revenue be generated on the airport with the intent that it will be returned to local users in the form of grants for land acquisition and capital improvements. Future airport revenues will be derived from several sources - hangar rentals, tiedown fees, land leases to FBO's fuel flowage, and gross receipt fees.

TABLE 18 : CASH FLOW ASSUMPTIONS 1985/2000
NEW FREMONT AIRPORT
(IN 000´S OF 1981 $)

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
A: INCOME																
..BASED TIEDOWNS	0.0	165.6	191.4	217.2	243.0	268.8	231.0	234.0	237.0	240.0	243.0	245.4	247.8	250.2	252.6	255.0
..HANGARS	0.0	151.2	151.2	151.2	151.2	151.2	294.0	294.0	294.0	294.0	294.0	294.0	294.0	294.0	294.0	294.0
..TRANSIENT TIEDOWNS	0.0	18.5	20.9	23.3	25.8	28.2	28.7	29.1	29.6	30.1	30.5	30.7	31.0	31.2	31.4	31.6
..LAND LEASES	0.0	25.0	25.0	25.0	25.0	50.0	50.0	50.0	50.0	50.0	75.0	75.0	75.0	75.0	100.0	100.0
..FUEL SALES	0.0	47.5	53.7	60.0	66.3	72.5	73.7	74.9	76.1	77.3	78.5	79.1	79.6	80.2	80.8	81.4
..GROSS RECEIPTS	0.0	26.4	29.9	33.3	36.8	40.3	41.0	41.6	42.3	42.9	43.6	43.9	44.2	44.6	44.9	45.2
....SUBTOTAL	0.0	434.1	472.1	510.1	548.1	611.1	718.4	723.7	729.0	734.3	764.6	768.1	771.6	775.2	803.7	807.2
..ANNUAL STATE ALLOCATION	0.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
..AIRCRAFT TAXES	0.0	52.2	58.7	65.1	71.6	78.0	78.8	79.5	80.3	81.0	81.8	82.4	83.0	83.6	84.2	84.8
....SUBTOTAL	0.0	57.2	63.7	70.1	76.6	83.0	83.8	84.5	85.3	86.0	86.8	87.4	88.0	88.6	89.2	89.8
......TOTAL	0.0	491.3	535.8	580.2	624.6	694.1	802.1	808.2	814.2	820.3	851.4	855.5	859.6	863.7	892.8	897.0
B:EXPENSE																
..SALARIES	0.0	125.0	130.4	135.7	141.1	146.4	151.8	157.1	162.5	167.9	173.2	178.6	183.9	189.3	194.6	200.0
..MAINTENANCE	0.0	10.0	11.4	12.9	14.3	15.7	17.1	18.6	20.0	21.4	22.9	24.3	25.7	27.1	28.6	30.0
..INSURANCE	0.0	8.0	8.3	8.6	8.9	9.1	9.4	9.7	10.0	10.3	10.6	10.9	11.1	11.4	11.7	12.0
..UTILITIES	0.0	20.0	20.7	21.4	22.1	22.9	23.6	24.3	25.0	25.7	26.4	27.1	27.9	28.6	29.3	30.0
..MISCELLANEOUS	0.0	5.0	5.4	5.7	6.1	6.4	6.8	7.1	7.5	7.9	8.2	8.6	8.9	9.3	9.6	10.0
......TOTAL	0.0	168.0	176.1	184.3	192.4	200.6	208.7	216.9	225.0	233.1	241.3	249.4	257.6	265.7	273.9	282.0
C: PROFIT (LOSS)	0.0	323.3	359.6	395.9	432.2	493.5	593.4	591.3	589.2	587.1	610.1	606.0	602.0	598.0	619.0	615.0
D: NEW CAPITAL REQUIRED	1028.3	1701.0	1157.8	0.0	0.0	300.0	0.0	0.0	0.0	0.0	186.4	0.0	0.0	0.0	0.0	0.0
E: ANNUAL CASHFLOW	-1028.3	-1377.7	-798.2	395.9	432.2	193.5	593.4	591.3	589.2	587.1	423.7	606.0	602.0	598.0	619.0	615.0
F: ACCUMULATED CASHFLOW	-1028.3	-2406.0	-3204.2	-2808.2	-2376.1	-2182.6	-1589.2	-997.9	-408.6	178.5	602.2	1208.2	1810.2	2408.2	3027.2	3642.2

TABLE 19
MAJOR REVENUE ASSUMPTIONS

Tiedowns - Based	$50/month
Tiedowns - Transient	$3/night
Hangars	$175/month
Land Lease	$0.50/square foot/year
Fuel Flowage	4% of sales price
Gross Receipts	2% of sales

Source: Wadell Engineering Corporation

New hangar construction is planned for the airport throughout the planning period. One new source of income will be the collection of hangar rental fees. Lease rates for these hangars should be set so that the revenue produced will offset the cost of construction. A $12,500 hangar amortized over a 20-year period at 12 percent would cost approximately $137 per month. Higher interest rates are usually paid by private enterprise. A minor loss during the first few years should be acceptable since hangar income after amortization is tremendous. The assumed initial rate is $175 per month. These estimates, of course, exclude any maintenance and accounting costs associated with development. It is assumed that the airport will build hangars only for single engine and small twin-engine aircraft.

Upon construction of the airport, the airport owner should collect tiedown fees for based aircraft. Rates for paved apron space at the new airport will be established at $50 per month. These charges should not be viewed as unreasonable since the cost of providing a tiedown position with taxiways is approximately $4,500 at today's cost with a resultant amortization as follows: at 12 percent for 15 years - $54.76, 30 years - $46.93; at 8 percent for 15 years - $43.60, 30 years - $33.48. Due to the cost of apron construction it is recommended that the apron be constructed by the airport owner using FAA funds and that it be used as a revenue source for collecting monthly rents for use on future airport improvements.

Transient overnight parking fees are assumed to be $3.00 per night for most aircraft. The night security staff would collect from each transient aircraft owner, and although the income would not be great, it would help offset some operating expense.

Future land leases are assumed to be set at 50 cents per square foot per year reflecting a 10% return on the value of developed industrial land without buildings. Under the terms of the leases, the tenant would be required to construct his own facilities, including buildings and pay his own utilities. All future leases should be written so that all structures built on leased land will revert to airport ownership after 30 years. Future fuel flowage fees should be established at approximately 4 percent of the sales price. At current prices this rate would provide the airport with about seven cents per gallon of fuel sold. This type of fee more equally divides the costs of airport services on the basis of use. Alternatively, the airport owner could develop and operate the

fueling facilities. This will require construction capital, but will result in more profit and total control over the quality of service.

A business gross receipt fee of 2% of eligible sales would be collected. Excluded sales are typically fuel (which is handled under flowage fees) and wholesale cost of aircraft.

In summary, the major sources of airport income as described in the Major Revenue Assumptions table will be tiedown fees, hangar rentals, land leases, fuel revenue and gross receipts fees. These rates will provide the airport with the income necessary to provide required services as well as develop new facilities as they are needed.

TABLE 20
AIRPORT STAFFING ASSUMPTIONS

	1985	1990	1995	2000
Airport Manager	1	1	1	1
Assistant Manager	-	-	1	1
Airport Superintendent	1	1	-	-
Secretary	1	1	1	1
Maintenance Foreman	-	1	1	1
Maintenance Workers	1	1	2	3
Security Personnel	1	1	2	2
Total Personnel	5	6	8	9

Source: Wadell Engineering Corporation

The operating expenses for the airport are comprised primarily of salaries, maintenance, insurance, utilities and miscellaneous items. One of the greatest expenses would be salaries, especially as personnel are added as activity increases. When the facility ages, more people are needed for maintenance activities.

TABLE 21
MAJOR EXPENSE ASSUMPTIONS

Salaries -	Airport Personnel 1985 - $125,000/year increase to $200,000/year by 2000
Maintenance -	1985 - $10,000/year increase to $30,000/year by 2000
Insurance -	1985 - $8,000/year increase to $12,000/year by 2000
Utilities* -	1985 - $20,000/year increase to $30,000/year by 2000
Miscellaneous Expenses -	1985 - $5,000/year increase to $10,000/year by 2000

*Tenants pay their own utilities.
Source: Wadell Engineering Corporation

A nominal amount of anticipated maintenance related to facilities has been identified in the Cash Flow Assumptions table. Maintenance expense is expected to increase throughout the planning period. Insurance and miscellaneous expenditures increase gradually as the activity of the airport increases with time. The primary increase in utilities is for electricity related to increased lighting at the new airport as well as increased water use.

For the purpose of the Financial Analysis, the specific assumptions noted above were made for income and expenditures. However, there are also a series of generalized assumptions underlying the entire analysis. They are that:

- o The forecast activity levels will occur as tabulated in this report.

- o No capital improvement expenditures in addition to those presented in the report will be required.

- o Improvements will be financed to the extent possible with Federal and state funds (assumed to be 90 percent of eligible items).

- o All 1981 dollars are used for income, expenses, capital improvements, and land acquisition costs during the 20-year period.

- o Specific analysis will be made prior to major commitments, and the airport cost accounting system and development plan will be monitored and updated as necessary.

Based on the financial assumptions, the annual income and expenses were combined to determine the operating profit (loss), and when coupled with the local share of new capital requirements - cash flow results. It is apparent in reviewing Table 18 that the new revenues generate an operating profit beginning in 1986 and continuing for each year through the year 2000. However, when combined with the sponsor share of new capital to match grants for land acquisition and capital improvements, there is a negative annual cash flow for 1985 through 1987. The cash flow remains negative on an accumulative basis until 1994. Two vital aspects to the validity of this table are the willingness and cooperation of the based aircraft owners to pay new fees to the airport fund and that FAA and state funding will occur and will be 90 percent of all eligible items.

The financial program for development of the New Fremont Airport should strive to achieve the ultimate goal of operating the airport in a manner to obtain reasonable revenue from airport users and to recover operating expenses, financial expenses, and depreciation; to maintain adequate reserves for protection against unpredictable contingencies; and to provide for future improvements and capital equipment. It is obvious that significant funding must be obtained in order to finance the development of a properly constructed airport facility at this site.

Based on review of the cash flow table, it is necessary to obtain maximum FAA and State funding and to meet cash flow requirements on a yearly basis. If it is assumed that the City of Fremont would own and operate the airport, the most effective method of providing the local share is through initiation of a City of Fremont aviation development tax or formation of an airport district. The estimated amount of annual funds would be approximately that amount shown as "annual cash flow." Short term bonds or municipal loans could be used to average high and low annual local funding requirements. A possible structure would be the formation of a Joint Powers Airport Authority that would sell revenue bonds and assure repayment by a lease agreement with the City of Fremont, having a general fund obligation based on a City pledge to make lease payments.

If the City of Fremont is unable or unwilling to undertake the entire airport development on its own, there are combinations of other alternative ownership possibilities. Airport development could be a joint venture of the cities of Fremont and Milpitas, or Fremont and San Jose, or even the three cities of Fremont, Milpitas and San Jose. The City of San Jose could also undertake airport development in Fremont without any other partners, but this would require use permits from the City of Fremont. Other combinations include the counties of Alameda and Santa Clara. They might be involved either individually, together, or in combination with some participating cities. It is not uncommon for counties to contribute funds to cities for airport operation and development even though the county has no equity position in the airport property.

When reviewing alternative ownership methods, it is important to realize that development of a general aviation reliever airport in Fremont provides varying degrees of aviation and community benefit to each of the affected jurisdictions. It is realized that new airport development in Fremont will relieve some traffic from airports located in both Alameda and Santa Clara counties, and yet will provide the greatest aviation benefits to the cities of Fremont and Milpitas. Similarly, the most direct economic benefit from aviation businesses would go to the City of Fremont, yet overall business benefits would be spread to both the cities of Fremont and Milpitas as well as to a lesser degree, both of the counties. Available aircraft parking and services at the existing Fremont airport constrain the existing economic benefits to the City of Fremont, and cause most of aviation business and income to take place at Reid-Hillview and San Jose airports. Development of a new airport in Fremont will not only return local business to the local area, but being a reliever airport will cause non-resident aircraft to park in Fremont thereby further improving the business climate.

IMPLEMENTATION

The cooperative consultant and City of Fremont and City of San Jose efforts in the planning process are brought to fruition through acceptance of this feasibility study, followed by implementation steps that include preparation and adoption of documents and appropriate environmental reports.

Start-up steps after receiving the finished plan can be separated into two primary categories - adoption and initial development. The key steps and relative timing of these activities are portrayed in the implementation diagram. The environmental review process is by both the State of California and the FAA. During 1983 the environmental report preparation and review would be undertaken followed by adoption of a development plan by the airport owner with incorporation of appropriate changes and additions related to the outcome of the environmental process. The City of Milpitas and Alameda and Santa Clara County Airport Land Use Commissions (ALUC) and Metropolitan Transportation Commission (MTC) should be actively involved in the review and adoption process. They all have a key role during development and operation of the airport.

The FAA review is both of the plan itself as well as review necessary for the primary federal action of "site endorsement." The site endorsement would come after completion of the FAA review and coordination among the various branches and divisions of the FAA. After site endorsement City and County height zoning enactment is desirable for protection of the future airport, with ALUC assistance.

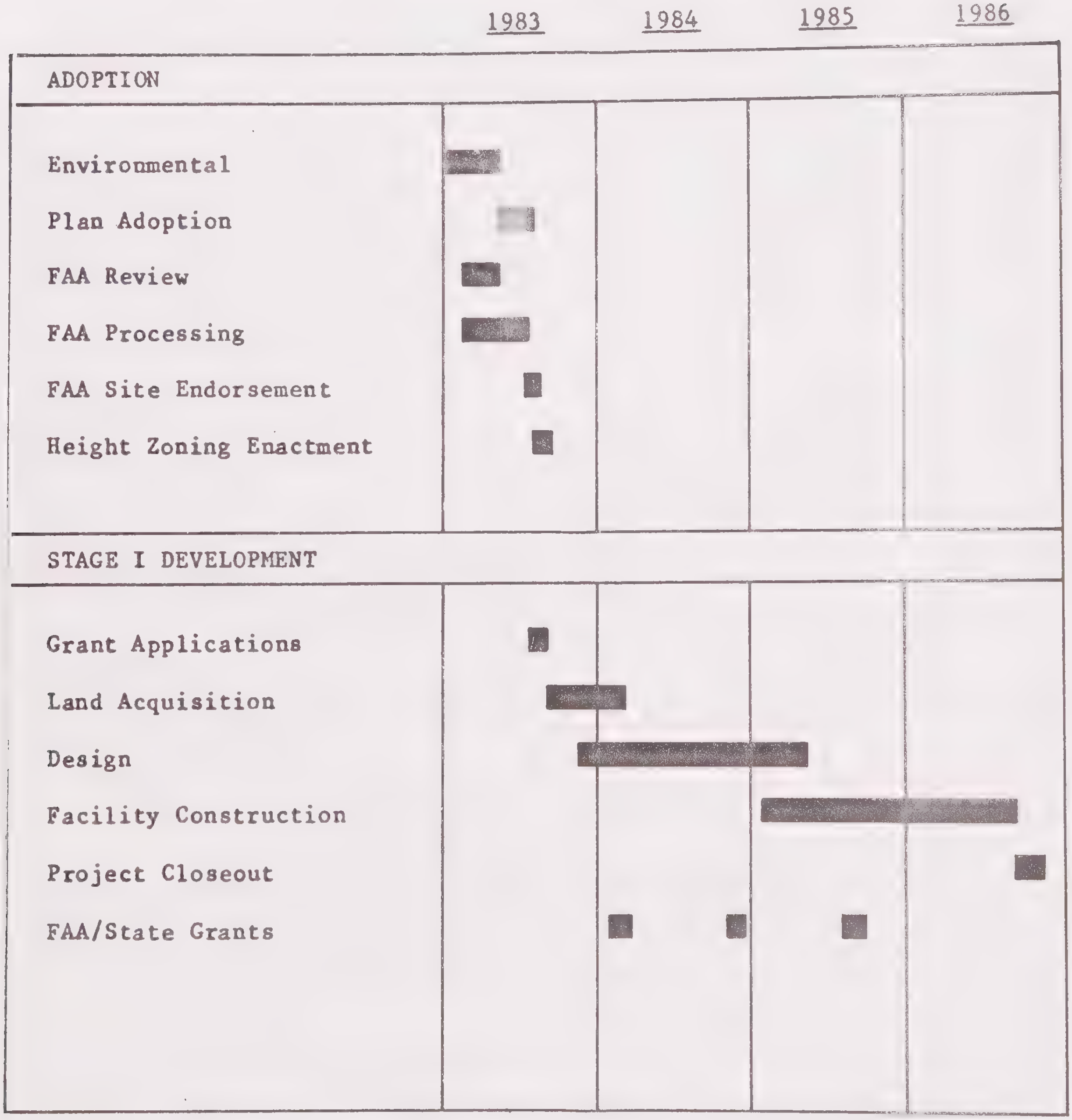
The Stage I development program commences with applications for State and Federal grants for airport projects. The land acquisition program can be time consuming and should be commenced as soon as possible to assure the land ownership prior to construction of airport facilities.

The facility design process would commence as soon as it is apparent that land acquisition will take place and the site will be developed as an airport. The initial design process will be for earthwork and site preparation, followed by design of airfield paving and lighting, access roads, terminal area utilities, and fixed base operator facilities.

After construction the project would be "closed out" with the State and Federal offices responsible for funding and implementation assistance. FAA and State grants would be utilized to the extent possible with multi-year grants initially covering some of the basic land acquisition, administrative costs, and early design work with subsequent grants for construction payments.

The future years will be sure to be challenging. With the cooperation of all involved, the New Fremont Airport could be one of the finest general aviation facilities in the State of California.

FIGURE 23: NEW FREMONT AIRPORT IMPLEMENTATION DIAGRAM



APPENDIX

APPENDIX 1: GENERAL AVIATION JOINT USE OF MOFFETT FIELD NAS

I. SUMMARY

In mid 1980 the City of San Jose contracted with Wadell Engineering Corporation to prepare a General Aviation Reliever Airport Site Feasibility Study. During the course of the study it was realized that joint use of Moffett Field Naval Air Station could provide significant general aviation relief to the South Bay area.

The study has revealed that Moffett Field Naval Air Station has suitable airfield facilities for use by general aviation aircraft. Necessary facility additions for ideal civil use would include FAA air traffic control, terminal area radar, instrument landing system for Runway 32R, aprons, terminal buildings and utilities, and auto parking and access road systems.

Without removing existing Navy and/or Ames Research Center buildings, the only opportunity spots for terminal facility development exist at the northwest, northeast and southeast ends of the airfield. The forecast terminal area facility requirements for general aviation use were superimposed on these potential sites. The facilities are able to physically fit within the northerly site areas, but not the southeast area. Significant impacts on current and planned uses would result.

The northwesterly terminal area development would essentially preclude significant expansion of Ames Research Center and would eliminate some current uses requiring open space. Access to the northwest terminal facilities would require crossing drainage channels along the westerly boundary of the property.

The northeasterly terminal area development is also possible within the site area in terms of space available, however, would require phase out of more than half of the Navy golf course as well as relocation or elimination of all or part of Navy explosive handling areas. Storage of explosives requires extensive land areas for clearance and would not be easily replaced within the existing Navy property. Access to the northeastern general aviation terminal facilities would be by extensions of existing expressways.

The southeasterly terminal area development does not fit within currently vacant land, and does impact early planned development of additional Navy parking aprons, storage and warehousing, as well as expansion of Air National guard facilities. This area has the least direct impact on the existing facility, but also has more difficulty for providing secure access corridors separate from Navy access systems.

In previous correspondence the United States Navy has identified criteria for consideration of joint use. Evaluation of Navy criteria with respect to joint use results in some beneficial arrangements. The City of San Jose would provide further airport development as well as contribute to maintenance and operations of the airport. Military security would not be compromised if a full time security force, acceptable to the Navy, would be provided without burden to the military. Access to the site

area would have to be through a separate gate allowing for full security of military areas.

Flight operations would not be impaired since there could be agreed upon restrictions to civil aircraft use and aircraft would be operating with FAA flight separation criteria suitable for the type and mix of aircraft. Military use of the airspace would have priority over civil use.

Military criteria also questions whether other reasonable alternatives to joint use are available. There are other general aviation airport sites and expansion alternatives in the South Bay area yet many are no better received locally than the Navy opinion regarding general aviation joint use.

Another military criteria for joint use is that the user be an authorized state or local government agency and be willing to assume necessary obligations for development and maintenance of facilities.

From the analysis, the preferred location for general aviation joint use would be the Ames Research Center property, followed by partial use of the Navy golf course. The southeast site has access constraints and inadequate land area. Direct development costs for parking of 550 aircraft with auto access and utilities is expected to range from $5 million to $7.5 million, depending on site conditions. There could be significant additional costs for relocating displaced Federal facilities.

The most significant advantage of general aviation joint use of Moffett Field Naval Air Station is the mutually beneficial development and maintenance cost-sharing. The most significant detriments are difficulties imposed upon the Navy and/or Ames Research Center by removing current land from its present uses as well as essentially eliminating major future expansion.

II. ANALYSIS

Moffett Field, California, is one of two naval air stations located in the San Francisco Bay Area. Naval Air Station (NAS) Moffett Field is located on the bay's west side, approximately 35 miles south of San Francisco and 10 miles north of San Jose.

The specific location of NAS Moffett Field is in Santa Clara County; it is within the Cities of Mountain View and Sunnyvale. The National Aeronautics and Space Administration's Ames Research Center is directly to the northwest of the station, while San Francisco Bay provides a northerly boundary, and the Lockheed complex is to the east.

In general, the area surrounding the station is heavily populated, and very little land is available that is not committed to urban land uses or tidelands. This situation places several constraints or pressures upon the station. Perhaps the most important is the relatively few areas available for the station to expand, making it necessary for Navy properties to be used efficiently. The sizable population in the area also places some constraints on the station's aircraft operations because of aircraft noise and safety hazards. However, the Navy demonstrates a strong interest in being a good neighbor. It has abandoned jet operations at the station and recently shifted approximately 70 percent of the aircraft touch-and-go operations to the Navy Auxiliary Landing Field (NALF), Crows Landing, California.

The local weather and climate are advantages of NAS Moffett Field's location. The mean temperature for the area is about 57 degrees F, and the annual rainfall is approximately 15 inches. The station is far enough south that the fog belt associated with the Bay Area is not a factor; therefore, the station enjoys excellent flight conditions about 95 percent of the year.

U.S. Highway 101 (Bayshore Freeway) is the principal roadway in the immediate vicinity of the station, providing a link to the major cities of San Francisco to the north and San Jose to the south. Access to other major interstate roadways via U.S. Highway 101 is possible. State Highways 92 and 84 to the north and 237 to the south provide access to the east Bay Area.

Locally, primary access is secured along Moffett Boulevard and Ellis Street, both City of Mountain View arterial streets. These arterials interchange with U.S. Highway 101--Moffett Boulevard via a full cloverleaf overpass and Ellis Street via a diamond underpass. Secondary access through the East Gate near the Lockheed facility requires use of Sunnyvale streets.

Existing facilities at Moffett include two parallel concrete runways 700 foot center to center from one another. The principal runway is 14L-32R, which is 9,200 feet long and 200 feet wide. The back-up runway is 14R-32L which is 8,120 long by 200 feet wide. Due to the sub-standard separation between runways (using Navy criteria), the Navy does not allow simultaneous runway operational use. There is no instrument landing system at Moffett, as would be used by civil aircraft, however, there is a radar approach procedure utilizing a ground traffic controller and

precision approach radar. The airport has a TACAN approach to the Runway 32 system, and approach lights are installed for aircraft landing on Runway 32R.

On both sides of the runway, there are parallel taxiways as well as north and south crossing taxiways. Large portland cement concrete parking ramps are provided on each side of the airfield, and three large hangar buildings, originally constructed for blimps, are noticeable on each side of the runway system. An air traffic control tower and base operations building is located to the southwest side of the runway system while major aircraft fueling areas are to the northeast. At the absolute northeast of the site is the Navy golf course and dangerous cargo area.

Current Navy use of Moffett Field Naval Air Station is well below available runway capacity. The types of current use include Navy owned and operated aircraft, NASA aircraft, the Navy Flying Club, and various other visiting or transient aircraft ranging from small general aviation aircraft on military business to large military charter type aircraft of a multi-jet engine type.

Based on extensive review of master plans for development of both Moffett Field Naval Air Station and NASA facilities, it became apparent that areas currently occupied or to be developed by both parties are essentially unavailable for civil use unless significant expenditures and relocation of activities were to take place. There are, however, three land areas at the northwest, northeast and southeast of the runway system that might be developed with less potential future impact on Federal government facilities when compared to fully developed parts of Moffett. These areas have been evaluated by siting general aviation terminal area facilities in order to portray civil development and to realize associated impacts of joint use at Moffett.

Northwest Terminal Area Considerations

Ames Research Center was established by Congress on August 9, 1939 as the second research center of the National Advisory Committee for Aeronautics (NACA).

Ames Research Center's original purpose was clearcut and urgent - develop technology to help win World War II. Initially, the primary mission was to study aerodynamic problems of aircraft operating at high subsonic speeds. Although subsequent years called for continued military preparedness through advanced technology, there also emerged a growing role of Ames in supporting applications of technology for civilian use.

The programs of Ames Research Center are directed towards research and development of new aerospace technology. This technology primarily supports space exploration efforts and improves the safety and performance of aircraft. Additionally, this research often benefits civil problems ranging from biomedicine and environmental pollution to urban planning and transportation.

Current areas of research include: short haul aircraft technology, flight simulation, theoretical and experimental fluid mechanics, planetary atmospheres, air-borne science and applications, and human-

factors technology for aircraft and space vehicles.

Also housed at the ARC are the Headquarters and the Aeromechanics Laboratory of the U.S. Army Research and Technology Laboratories. Army researchers work in close cooperation with NASA personnel on programs of mutual interest, primarily in the field of rotorcraft technology.

The Ames Research Center occupies about 430 acres of land and has a facility value in excess of 560 million dollars and an estimated replacement value of over 1.7 billion dollars (March, 1981).

In general, the physical plant of Ames comprises many specialized and unique facilities for aerospace research in the categories of physical science, space science and life science, all of which are included in the mission of the Center.

Many facilities at Ames are of a "low-physical profile" nature, such as underground storage tanks and small, remote research and test structures requiring large areas of open space around them for test isolation or personnel safety clearance. Similarly, V/STOL research operations require runway and ramp areas, with very little structure. Larger aircraft runways are part of the Naval Air Station but are used by Ames and provide a great deal of open space to one edge of the Ames complex.

In general, the Ames-Moffett Field complex lies within the cities of Mountain View and Sunnyvale, Ames Research Center and the western portion of Moffett Field are related to the City of Mountain View. The eastern portion of Moffett Field is generally oriented to the City of Sunnyvale because of its present activities east of the runway and its proximity to the Lockheed Missiles and Space Company of Sunnyvale.

The "North Bayshore Area Plan" adopted in 1977 by the Mountain View City Council, outlines the goals for the land west of Ames and north of the Bayshore Freeway. Of the approximately 1500 acres of incorporated lands in the North Bayshore Area, about 45% is presently in public ownership and devoted to the development of a Shoreline Regional Park by the City of Mountain View. It is proposed that park visitors will have access to the salt evaporator ponds and San Francisco Bay to the north of Ames. South of the Park are roughly 800 acres of land proposed by the City of Mountain View to have a mixture of uses.

The Plan provides for a strip of approximately 350 acres adjacent to Bayshore Freeway for industrial facilities and corporate offices to be developed over the next 15 years in a park setting compatible with the Shoreline Regional Park. A 13 acre parcel at the northeast quadrant of the Rengstorff-Bayshore Interchange is commercial land use. This location near the Park is intended for hotel-motel purposes serving visitors in the area utilizing recreation facilities provided by the Park. Additionally, restaurants, conference facilities and other support activities would serve both the hotel-motel complex and the adjacent industrial and residential areas. A 70 acre parcel, southwest of the Stierlin-Charleston Road intersection is designated as mixed use: residential-industrial-commercial.

On the northeast boundary of Ames the Mid-Peninsula Regional Open Space District (MROSD) has recently acquired about 54 acres of wetlands adjacent to Stevens Creek as a marshland preserve. Between San Francisco Bay, the northern boundary of MROSD and the Navy are the salt evaporator ponds owned by the Leslie Salt Company. It is anticipated that these ponds will continue in operation for the foreseeable future.

Presently, Ames has relatively underdeveloped space to the north, roughly twice as large as the existing developed area. A Warehouse and Storage Area now exists under U.S. Navy jurisdiction as an island of approximately 16.6 acres in the surrounding Ames property. In 1968 this warehouse was planned to become available for Ames use; however, subsequent policy changes precluded acquisition of the warehouse and Ames has satisfied its present storage needs by the construction of a Supply Support Facility. However, to satisfy possible future research and development requirements, the Moffett warehouse might be acquired in exchange for NASA'S funding the construction of a new Navy warehouse southeast of the runways.

Considering the current importance of missions assigned to Moffett Field, no Ames expansion is anticipated to the south, southwest or east, with the future possible exception of the Warehouse and Storage Area. The acquisition and conversion to marshland of the property north of Ames by MROSD and current federal protection policies for "wetlands" precludes consideration of expansion of facilities in that direction; however, for safety reasons, Ames may consider acquiring the corner of this wetland within the secondary safety clearance zone of the Static Test Area.

The Ames land use plan identified various areas for static tests, safety clear zones, magnetic isolation, vibration isolation, and flight & drop testing. In addition there are support areas in the safety buffers for these future land uses. Since NASA performs research and development, it is unclear as to exactly what their facility requirements will be since NASA itself does not fully know the support requirements for undetermined future research. The master plan for NASA does, however, identify use of all future lands as well as relocation of current Navy activities from NASA land to other Navy sites. If the NASA plan is carried out then there is essentially no land available for northwest terminal area facilities.

If northwest terminal area facilities, to satisfy the projected civil demand, were developed, access would be from the Navy parallel taxiway system with connecting taxiways to current NASA property. Aircraft apron areas, terminal buildings, auto parking and access would be placed on the NASA property. The impact on the future mission and accomplishment of NASA could be quite drastic, possibly to the extent that remaining Ames facilities might become non-functional and therefore, need to be relocated to another airport.

Northeast and Southeast Terminal Area Considerations

Most of Moffett Field Naval Air Station's land is currently utilized either with existing facility development, or various clearance areas for

runway and taxiway use, air space and the handling of explosive materials.

The northeast area has large explosive clearance zones for the handling of various Navy explosive material. These zones include the end of Runway 14L as well as magazine areas within the Navy golf course. Future development within the area is expansion of magazines as well as relocation of the ordinance handling pad. These areas are less intensely developed due to the fact that explosive criteria prevents congregation of people or extensive facility development. The golf course is considered a compatible land use since it is not frequented by the same people each day, users pass through the area, and it provides a buffer zone to other developed areas.

The northeast terminal area facilities would be developed with access from the Navy parallel taxiway system with necessary connecting taxiways to the apron areas. Terminal buildings, auto parking and auto access would be on the east side of the taxiways.

It is apparent that the facilities can be physically located on the available land in terms of size relationship, however, major development of facilities would significantly reduce the golf course land use area and could require relocation of some explosive storage and handling activities. The greatest difficulty in this relocation is where to put the facilities, since the explosive critical areas are quite large and the air station is land locked to the north by the San Francisco Bay. Another alternative would be to eliminate explosive materials at Moffett, however, that would be counter to the Navy's mission and would restrict their capabilities in performing at the site.

Projects to be developed in the southeast area include expansion of aircraft parking apron and maintenance facilities as well as ground support equipment, supply warehouse and washracks. It should also be realized that any relocation of Navy storage from NASA land would most likely occur in the southeast area.

Land Adequacy and Development Costs

If the year 2000 demand forecast for parking 550 civil general aviation aircraft at Moffett were satisfied, approximately 80 acres of land area would be needed including 15 acres of airport related businesses and services. As illustrated the three site areas have a maximum space available of 160 acres in the northwest, 140 acres in the northeast, and 40 acres in the southeast. It is realized that both Ames Research Center and the Navy do not consider any of this land area available for civilian use. Access to these three site areas would be as shown with the southeast site area access most difficult due to Macon Road, an internal Navy thoroughfare connecting both sides of the airfield. This roadway would be severed by general aviation development, and in order to maintain Navy security, an expensive, labor intensive security force would have to be provided by the civil users.

PLANNED NAVY DEVELOPMENT AND GENERAL AVIATION JOINT USE SITE ALTERNATIVES

Note: Only projects that impact currently "vacant" land are illustrated.

If there were only general aviation training activity at Moffett utilizing the runway systems but not basing of aircraft then no land would be required and impacts on the air station would be minimal.

Development costs for general aviation use at Moffett would include necessary access roads, fencing, auto parking, small terminal building, aircraft parking aprons and hangar areas, and taxiways to the Navy runway and taxiway systems. Parking of 550 aircraft on a new general aviation apron could cost as much as $4 million, with fencing and utilities ranging from $500,000 to $1 million depending on the selected site characteristics. Auto parking and access roads could range from $500,000 to $1.5 million especially if bridges over creeks and channels are required. A fully equipped FAA tower with radar could be $1 million, although Navy air traffic control facility might be utilized with cost sharing.

As a result, a low range of development cost would be $5 million, with a higher range of $7.5 million. This excludes construction of any buildings if desired or required as well as construction of airport maintenance facilities and providing equipment.

Access Considerations

Access to Moffett Field is provided by numerous major links in the regional transportation system. The Bayshore Freeway (U.S. 101) and Highway 237 (Alviso-Milpitas Road) most directly serve Moffett, although major links to the area are also provided by the Stevens Creek Freeway, the Central Expressway, and Middlefield Road. Access to the east side of Moffett through the Lockheed complex is provided by Sunnyvale Avenue and Mathilda Avenue.

The 1980 Santa Clara County General Plan indicates that morning rush hour congestion along Highways 237 and 101 in the vicinity of Moffett Field is expected to intensify by 1990. The County recommends upgrading 237 to freeway standards between Highway 17 and the Lawrence Expressway, thereby increasing capacity along this route.

The 1976 Master Plan for Moffett Field noted that a major traffic problem exists at the station, primarily at the main gate area and, less intensively, at the south gate. Traffic approaching the air station creates congestion that, on occasion, clogs the northbound off-ramps to the Bayshore Freeway. Internal circulation at the station is difficult because of the scattered nature of many services and facilities. The Master Plan included recommendations for moving the main gate east to allow 300 feet of queing space, a new NASA access road to the west of the facility, and expansion of the Ellis Street off-ramp to the Bayshore to two lanes to relieve congestion of the south gate entrance.

While some improvements are anticipated by Caltrans in the roadway system around Moffett Field in the near future, they are minor in character. A five year Transportation Improvement Program (TIP) has an auxiliary lane and ramp metering scheduled for installation between Route 17 and San Mateo County on U.S. 101 sometime between 1983 and 1984. As well, hearings have recently been completed for the addition of two high occupancy lanes for Route 237 between Route 17 and the Lawrence

Expressway. Overall, however, there are no planned improvements on the ground transportation system in the area around Moffett Field enclosed by Highways 101 and 237.

It is realized that general aviation access would have to be separate from Navy access for security reasons. Access to the northwest terminal area site could be via the Stierlin Road Interchange. The new access corridor would have to cross a major drainage channel. Access to the northeasterly site could be via extension of the Lawrence Expressway along Carribean Drive supplemented by access from Mathilda Avenue. Access to the southeast area is hampered by the freeway, Lockheed and Macon Road.

Noise Considerations

To evaluate air operations at Moffett Field, an Air Installation Compatible Use Zone (AICUZ) study was initiated by the Navy for Moffett Field. In 1976, the study reported contour levels associated with air operations at Moffett as well as actions and implications of study findings. The study identified approximately 18 acres impacted by normal operations of Moffett Field. Approximately half of the AICUZ area lies over bay shallows or water. However, conflicts of land use compatibility exists within the remaining acres. There are over 100 acres of residential development adjacent to the Central Expressway which constitutes a serious existing land use incompatibility. There are also approximately 1600 acres of other residential development and public facilities undesirably located beneath the approach to Runway 32. Runway 32 is the most active runway of Moffett Field, utilized 90 percent of the time.

Noise levels at Moffett Field developed for the AICUZ study represents efforts to reduce ground noise impact. In the 1950's and 60's, NAS Moffett Field was one of the Navy's major jet installations. However, the station's present role is to serve as the center of anti-submarine control operations for the Pacific Coast involving the quieter P-3 Orion turbo-prop aircraft. Some of the actions undertaken by the Navy to reduce noise impact include restricted hours for touch and go landings, prohibitions on jet departures at certain times of day from certain runways, identifying minimum altitudes, lag of air traffic patterns, programming flight patterns to minimize noise impact on highly congested areas, such as schools, theaters, apartment complexes, etc.

CNEL contours developed for general aviation joint use of Moffett Field NAS have been presented earlier in this report. The 55 CNEL noise contours are totally north of the Bayshore Freeway, while the 65 contours are totally within the property. There would be overflights of some residential areas due to traffic patterns for general aviation aircraft landing at Moffett on the Runway 32 system, unless the civil aircraft touchdown point were shifted to mid-field, since terminal area facilities would be to the north end. Civil joint use of Moffett would not provide any significant increased noise levels south of the Bayshore Freeway.

Navy Joint Use Criteria

The City of San Jose has in the past contacted the United States Navy and requested consideration of general aviation joint use activity. The United States Navy has repeatedly, both verbally and in writing, indicated that joint use is totally unacceptable, primarily due to hampering of the military mission, incompatibility of flight operations, and the lack of necessity due to other alternatives being available.

The Navy's position that joint use is not acceptable is based upon its evaluation of criteria factors.

"The Arrangement Must Be Mutually Beneficial"

It is financially beneficial to the Navy if the City of San Jose were to undertake joint use, because the City would most likely contribute to the costs of airport facility, operation and maintenance including all necessary civil facility construction, and proportionate maintenance on runways, taxiways, lighting systems, air traffic control facilities, necessary utilities, as well as helping to obtain improved roadway systems.

"The Security of Military Operations, Facilities, Or Equipment Might Not Be Compromised"

Civil use of Moffett would have to be through a totally new ground access system with appropriate fencing and security. This new system is necessary from a physical planning viewpoint. It is best for both parties that a separate access and security system be established. All civil users would be contained in the civil terminal area facility. Secure access can be provided to the northwest and northeast site areas.

Military Flight Operations Must Not Be Substantially Impaired"

It is expected that significant general aviation joint use would impair military flight operations unless suitable traffic control and coordination were to take place. The Navy considers the 700 foot separation between runways substandard and therefore does not allow simultaneous operations of aircraft on both runways. FAA criteria allows same direction operations during visual flight conditions by all categories of aircraft with runway centerline separations of 700 feet. In fact, the separation of the Runway 28 system at San Francisco International Airport is 750 feet, and simultaneous air carrier operations take place in visual weather.

The Navy also indicates that an FAA specified minimum of 6,000 foot separation must be maintained from any other aircraft when operating with Moffett based P-3 aircraft or any other category III aircraft (weighing more than 12,500 pounds or having more than two engines or of a non-propeller type). The Navy has chosen to utilize a 9,000 foot separation. This separation should be acceptable to civil users.

"Air Safety Must Not Be Degraded"

The Navy AICUZ study considers Moffett as one of the Navy facilities throughout the United States that has some of the greatest accident potential due to general aviation operations in the proximity.

Establishment of joint use of Moffett Field Naval Air Station is expected to increase the importance of airspace at Moffett Field due to combined military and civil activity.

It is anticipated that the FAA would establish increased controller services and equipment to better handle the traffic volumes resulting in enhanced protection of Moffett airspace.

"There Is No Reasonable Alternative"

The Navy has stated that there are other reasonable alternatives and that Moffett Field should not become the solution for transfering general aviation overcrowding from other parts of the South Bay area. There are other alternatives, however, they have their difficulties as well. Expansion of general aviation at San Jose Municipal Airport could occur, however, that creates increased opportunity for conflict with larger air carrier civil aircraft of which the flight frequency and volume of large aircraft traffic is much greater than the heavy aircraft use of Moffett field NAS.

Development of additional general aviation facilities at Palo Alto and Fremont as well as the south county area could occur, however, it has already been assumed within this report that future development would take place at various other locations and unmet demand would still not be accommodated.

Another alternative would be public agency decisions not to meet growth demand in general aviation in the South Bay area. While that alternative may not be considered desirable by general aviation users in the business/industrial communities, it is, however, an alternative.

"The Proposed Joint User Is An Authorized Government Agency Willing To Assume Obligations And Expenditures"

In order to expend FAA Airport Improvement Program funds a local agency must act as an airport sponsor to accept grants and meet grant obligations. Such local agency could be a city, county, airport district or authority. In order to receive FAA funds for airport development, a sponsor would have to have fee title ownership of airport land or a long term lease (more than 20 years) for the civil airport portions of Moffett Field NAS.

Revenues would be collected from civil airport users and applied to necessary development needs and operations of the air station. Since these would be collected for airport uses it is assumed that the local agency expenditures and revenues would be applied to development and operation of Moffett Field NAS.